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ABSTRACT

This publication contains the Applied Mathematics Curriculum (Communications and Electronics) for grades 11 and 12 for the Cincinnati (Ohio) Public Schools. The curriculum is part of a larger program (the Applied Academics Program), which emphasizes the integration of mathematics and the language arts with vocational content. Included in the document is a description of the Applied Academics Program (including its philosophy, goals, and evaluation policy), the Applied Mathematics Program--Junior Year (including its philosophy, goals, and objectives) and the Applied Mathematics Program--Senior Year (including its philosophy, goals and objectives). The curriculum outlines include vocational student objectives and student activities and related academic student objectives and student activities. The appendices contain evaluation instruments and forms. (RH)

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STATEMENT OF APPROVAL

Pursuant to all requirements of the Ohio State Department of Education, the course of study contained in this manual has been developed and approved by the Cincinnati Public Schools for use in:

Subject: Applied Mathematics I & II - Algebra I

Grade(s) 11 & 12

School: Cincinnati's Comprehensive High Schools

Board of Education Approval: February 25, 1980
September, 1985

APPLIED MATHEMATICS

COMMUNICATION ELECTRONICS

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1984

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1985-1986

The project now continues, broadened and expanded, under its new name, Applied Academics; and more specifically, Applied English and Applied Mathematics. For the additional writing and revision, we gratefully acknowledge Ronald Hartzel, Joseph Heink, Everett Newman, Albert Paddock, Kenneth Skirtz, Ronald Smith, Kathy Witherup, Donella Hess, Maridee Kessen, Ruth Robinson, Della Wiles, Nora Walton, Sue Raudabaugh, Theresa Penn, and Gary Lewis. The editing was done by Betty Ottesen.

APPLIED ACADEMICS PROGRAM

INTRODUCTION

Background

During the 1983-84 school year, VETIP (Vocational Education Target Intervention Program) was piloted at Withrow High School in the carpentry and construction electricity classes. Three curricula - mathematics, language arts, and the vocational - were interrelated so that what the student learned in one was reinforced in the other two. Vocational students became used to receiving assignments to do written research projects from their vocational teacher. They carried models constructed in the vocational laboratory into their English class. Their mathematics teacher gave writing assignments.

The basic premises of this model program were as follows: - instruction in language arts and reading is more effective if it is related to vocational content and is given either immediately before or at the same time as that content is taught by the vocational teacher; evidence of personal interest and concern from the teacher affects students' academic achievement; students who are actively involved in learning are more successful in school; the coordinated effort of teachers, counselors, and administrators is necessary to effect changes in the learning environment that will enable a significant number of pupils to successfully complete their secondary education.

In 1984-85 VETIP was implemented by a team of teachers, a counselor, and administrators. Counselors optioned students from VETIP vocational classes into VETIP language arts classes. All of the students from one vocational class, except those who were in advanced placement English, constituted one language arts class. The class stayed together for four periods each day (a three-hour vocational class plus one period of language arts).

Applied Academics Today

The project being implemented currently follows these same guidelines, though expanded to include mathematics as originally intended. Its name speaks its purpose and chief emphasis - applied academics.

The teaching team is primarliy comprised of the math teacher, the English teacher and the vocational teacher. Administrators and counselors are support persons in the main drama.

The central person on the team is the vocational teacher, and it is his/her responsibility to coordinate the activities of the team. Before each unit of instruction in the vocational class, this teacher gives to the academics teachers a Unit Communication Form (see Form B) which provides them with the information they need to give related instruction.

For each student, the vocational teacher keeps on file a folder containing the following information: class schedule, diagnostic test information (see Form C), Student Profile, if issued, (see Form A) and the Student Evaluation Sheet (see Form D).

At the end of each term, the teachers meet to assess the progress of each student and to complete the specified sections of the Student Evaluation Sheet. At other times, the teachers informally confer so that each one is constantly informed of individual student progress in both the affective and cognitive domains.

Classroom Atmosphere

One of the basic premises of this program is that the learning environment provided by the teacher greatly affects students' achievement. The teacher's general manner usually sets the tone for the class. A pleasant expression, neat appearance, and a command of authority let the student know that there is a job to do.

Effective use of authority is one of the most difficult concepts to master. The heavy-handed autocratic teacher might succeed in holding the forces in line, but the environment he/she provides is usually not one where students feel comfortable. At the other extreme is everyone's pal, the teacher who takes a peer approach to students. The environment provided by this teacher is usually so free that students do not sense any direction in their learning.

Somewhere between these two is the professional and caring teacher in the role of manager of a positive learning environment. Calmness, concern, firmness, and consistency are characteristics of this teacher. He/she starts each class promptly with a motivating activity. Mundane beginnings with such activities as roll call tell the student that the teacher is not terribly interested in or certain about what is going to occur in class.

From the beginning to the end of class, the effective teacher has a clear plan of the learning activities in which the students are to be engaged. Long lectures and question-answer discussions where the teacher asks the questions and three or four students provide all of the answers do not keep interest alive. Passive listeners soon get bored and listless.

This teacher also finds time to talk individually with students. He/she lets the student know that there is a cooperative effort among Applied Academics team members to help him/her succeed in school.

Frequent contacts are made with the student's parents. Home visits are recommended. As one way of exploiting the student's strengths, the teacher contacts the parents to congratulate them on something good that their child has done. Frequently, the only contact teachers have with parents concerns some negative aspects of the child's behavior.

Efficient management of the daily routine of any class sets a business-like atmosphere conducive to learning. Systems for checking out tools, using the restroom and going to lockers are developed so that each request does not call for a decision by the teacher. Consistency, fairness and a set pattern usually remove these kinds of activities from the realm of potential conflict and disruption.

Rotation of responsibilities among students is important in a vocational class. Each student needs ample opportunity to experience responsibility in a number of situations during the course of the year. For instance, this week's tool room supervisor may be next week's crew foreman.

Students quickly sense that the teacher is in control of the environment and sincerely cares about what happens to them. Even though poor behavior must be dealt with, the effective teacher focuses attention on students' acceptable behavior. Praise is given in a genuine manner. Students' strengths are used as the bases for learning.

The success of the Applied Academics Program is directly related to the environment provided by the teacher. The teacher must make the students feel that they are part of the class and that they can succeed in school.

Directions for Use of Course of Study

Part II of this course of study contains the curriculum for the vocations, English, and mathematics. These have been written during the summers of 1983, 1984, 1985 and 1986. They are subject to revision as the New Courses of Study for English and Mathematics are adopted and as users give further input. All curricula follow approved graded courses of study for the appropriate subject area.

One of the premises of the program is that mathematics and language arts instruction should be related to vocational content and given at about the same time as that content is taught. Therefore, there are columns for those teachers. In the English Activities column, suggetions for teaching vocabulary, both technical and non-technical, are given. The vocational teacher lists the words for the unit on the Unit Form and gives it to the English teacher.

Reading skills needed in comprehending the specified sections of the text are also listed in this column. These are the same reading skills taught in any class, but here they are taught using the vocational material as the context. Practice writing exercises are included at relevant points in the curriculum.

In the column titled Math Activities, areas of mathematics covered in the vocational unit are listed. The vocational teacher gives the mathematics teacher a more specific listing on the Unit Form. The instruction given by the mathematics teacher in basic computational skills is based on diagnostic test results. However, in teaching these basics, the mathematics teacher uses examples that are relevant to the content being studied in the vocational program. For instance, in learning to figure area, the student may determine how many twelve-inch square tiles are needed to cover a kitchen floor that is ten feet by twelve feet.

The English and mathematics teachers use this program to relate basic skill instruction to content instruction and to combine their teaching when possible. Reading graphs and working word problems are areas that call for reading and mathematical skills. The teachers may elect to team teach or in some other way supplement each other's work.

The forms included in this program are not intended to make the teacher's paperwork more cumbersome but to ease the transfer of information among teachers who are working toward a common goal -- students' success in their vocational program. Individual teachers may develop better methods of involving students in the learning process, more exciting motivating activities, more creative approaches to teaching the units. The daily lesson plans of two carpentry teachers using the program may differ in activities but should be similar in that they reflect the premises of this program and the coordination of effort among the support team.

Each teacher's effectiveness related to the vocational student is evaluated in terms of the student's achievements, attendance, number of discipline referrals, and overall adjustment to school. All people working on the team are responsible for the model's effectiveness.

District Philosophy of the Cincinnati Public Schools

The purpose of the Cincinnati Public Schools shall be the perpetuation and improvement of the democratic way of life. To this end, the schools shall strive to develop in children the knowledge, skills, habits, understanding, attitudes, and character traits essential for rich personal living, for sound choice of and effective participation in a vocation, for noble and satisfying human relationships, and for responsible, contributing citizenship. Important among the outcomes to be achieved are staunch moral character and appreciation of spiritual values; love of home and country; respect for duly constituted authority; genuine concern and thoughtful consideration for the welfare and rights of others regardless of race or creed; willingness to act in the interest of the general welfare; disciplined approach to the varied responsibilities of life; and the desire ever to improve in those competencies essential to effective personal and social living.

Realizing fully the great responsibility of the schools of the community in the pursuit of these objectives and outcomes, the Board of Education believes they can be satisfactorily achieved only with the full cooperation and support of all agencies of community life that share responsibility for the welfare and development of children and youth. Among these, the responsibility of the home is primary. The development, therefore, of close relationships with these agencies, and in particular, a home-school partnership of responsibility and effort, is a principle aim of the schools.

The superintendent shall, from time to time, with the advice and consent of the Board of Education, prepare statements of specific objectives consistent herewith, and these statements shall serve as the basis for determining the curriculum and instructional practices of the schools and for evaluating their effectiveness.

APPLIED ACADEMICS

PROGRAM PHILOSOPHY

We believe that three curricula - mathematics, English and the vocational content - can be interrelated so that what the student learns in one class can be reinforced in the other two.

We believe in the following basic premises: instruction in communication skills and math is more effective if it is related to vocational content and is given either immediately before or at the same time as that content is taught by the vocational teacher; evidence of personal interest and concern from the teacher affects students' academic achievement; students who are actively involved in learning are more successful in school; the coordinated effort of teachers, counselors and administrators is necessary to effect changes in the learning environment that will enable a significant number of pupils to successfully complete their secondary education.

We believe that the learning environment provided by the teacher greatly affects students' achievement. The teacher's general manner usually sets the tone for the class. A pleasant expression, neat appearance, and a command of authority let the student know that there is a job to do. Effective use of authority is one of the most difficult concepts to master. A positive learning environment will be established through calmness, concern, firmness and consistency. Efficient management of the daily routine of any class sets a business-like atmosphere conducive to learning.

We believe that a team effort among the three teachers provides the students with coordinated/related instruction and a network of support which actively involves them in learning, thereby motivating the student to achieve. The team members meeting on a regular basis to interact, plan and implement the course of study/curriculum help create the desirable climate.

We believe that the most effective approach to teaching the vocational applied academic skills is an integrated one. This instructional approach is most effective when it is:

- built upon student experineces
- developed within the context of the language used by students
- used in real and life situations

APPLIED ACADEMICS

PROGRAM GOALS

I. The Vocational Applied Academics Program will provide lesson plans with the vocational content as the core of the integrated English and mathematics skills. Therefore, all skills will be taught with the vocational content as the basis.

II. The Vocational Applied Academics Program will provide continued opportunities to develop listening, speaking, observing, reading, composition, and writing skills.

III. The Vocational Applied Academics Program will provide continued opportunities to develop logical thought, sequencing, computational mathematics and theoretical mathematics skills.

IV. The Vocational Applied Academics Program will provide assessment of student progress in both the affective and cognitive domains.

APPLIED ACADEMICS

PUPIL EVALUATION POLICY

An evaluation of students' cognitive growth in the Vocational Applied Academics Program can be assessed through a variety of regular classroom procedures. The methods used should be ongoing, collective, progressive, relevant and valid. The Student Profile Form will be an ongoing "case study" collection instrument.

In the vocational area, student success can be measured through objectives written/oral tests, daily class participation, observation of completed tasks, checklists of duties or specific skills, and the actual performance of tasks required.

In the academic areas, student skill growth can be assessed through objective testing, spoken and written use of language, compositions, projects, daily classroom participation, speeches, panel discussions, reports, essay tests, and defining/explaining mathematical procedures or axioms.

To meet districtwide testing requirements for the competency based education in reading, writing and mathematics, standardized tests, CIMS and writing samples will be used.

The evaluation of the students' affective growth will be assessed through attitude scales, quarterly evaluation by teachers, conference recording and group rating forms.

APPLIED ACADEMICS

MATHEMATICS

THE APPLIED MATHEMATICS OBJECTIVES AND ACTIVITIES FOR EACH VOCATIONAL CONTENT AREA ARE TO BE INTEGRATED INTO THE GRADED COURSE OF STUDY AND THE CURRICULUM BULLETINS ADOPTED BY THE CINCINNATI PUBLIC SCHOOLS.

APPLIED ACADEMICS
MATHEMATICS
PROGRAM PHILOSOPHY

Mathematics is a growing body of information and a set of processes. It originates in the world of reality, is abstracted, and formalized into a logical system of facts, concepts, and rules. It is used to describe the quantitative and spatial aspects of the world, and as a tool in problem solving, scientific investigation, and technological development. All people use mathematics to some extent in their daily lives.

The Applied Academics Mathematics Program in the Cincinnati Public Schools is designed to enable all pupils to learn mathematics and achieve skill with its use in order to reach their full potential and to cope with the quantitative and spatial aspects of their environment.

Mathematics is to be taught so that pupil self-image is enhanced and good attitudes toward mathematics are developed. Instructional strategies and content are to be selected in accordance with knowledge of child development and learning theory. Manipulative materials, readiness activities, instructional aids, and realistic applications related to the vocational content are used. Ideally, mathematics will be viewed by the learner as a meaningful activity having many applications and not merely as a mental discipline. All areas of mathematics are more easily grasped when they are applied to practical daily and vocational applications in problem solving.

The goals in this program include more than computation. Daily use of such skills as estimating, problem solving, interpreting data, organizing, measuring, and especially applying mathematics to vocational situations is essential if students are to master the basic mathematical competencies needed for daily living and on the job.

APPLIED ACADEMICS

MATHEMATICS

PROGRAM GOALS

The goals of the Applied Academics-Mathematics Program of the Cincinnati Public Schools are to provide each student with the opportunity to master the following skills, as related to an identified vocational area.

I. The Applied Academic Mathematics Program will provide continued opportunities to apply the four basic mathematical operations.

II. The Applied Academic Mathematics Program will provide continued opportunities to apply skills in reading, interpreting and constructing charts, graphs, tables, handbooks, and reports.

III. The Applied Academics Mathematics Program will provide continued opportunities to apply mathematical concepts and operations.

IV. The Applied Academics Mathematics Program will provide continued opportunities to apply measuring skills.

V. The Applied Academics Mathematics Program will provide continued opportunities to apply skills in calculators and computers.

VI. The Applied Academics Mathematics Program will provide continued opportunities to apply mathematics skills to solve consumer problems.

APPLIED ACADEMICS

MATHEMATICS

PROGRAM OBJECTIVES

I. Basic Operations

A. The program provides opportunities to develop skills in whole numbers

B. The program provides opportunities to develop skills in decimals

C. The program provides opportunities to develop skills in percent

D. The program provides opportunities to develop skills in fractions

II. Reading, Interpreting, and Constructing

A. The program provides opportunities to read, interpret and construct charts

B. The program provides opportunities to read, interpret and construct graphs

C. The program provides opportunities to read, interpret and construct tables

D. The program provides opportunites to read, interpret and construct handbooks

E. The program provides opportunities to read, interpret and develop reports

III. Mathematics, Concepts and Operations

A. The program provides opportunities to solve relevant problems

B. The program provides opportunities to check reasonableness of solution

C. The program provides opportunities to interpret results

IV. Measuring Skills

A. The program provides opportunities to use measuring skills related to metric units

B. The program provides opportunities to use measuring skills related to English units

V. Computer and Calculator Skills

A. The program provides opportunities to develop skills related to computer usage

B. The program provides opportunities to use calculators for problem solving and to verify solutions

VI. Consumer Problems

A. The program provides opportunities to calculate income

B. The program provides opportunities to understand banking procedures

C. The program provides opportunities to identify consumer credit

APPLIED MATHEMATICS

SUBJECT OBJECTIVES

A. Whole numbers, decimals, fractions, and percents

The student will:

1. add, subtract, multiply, and divide whole numbers, decimals, and fractions
2. round numbers and estimate computational results
3. reduce fractions
4. change: fractions to decimals, decimals to fractions, percents to fractions, decimals to percents, percents to decimals
5. determine: the percentage of a number, the percent one number is of another, the percent of increase or decrease
6. compare two numbers as ratios
7. use ratios to express rates
8. solve direct and indirect proportions
9. perform the basic operations with denominate numbers

B. Charts, graphs, tables, handbooks, and reports

The student will:

1. read and interpret graphs, tables, charts, handbooks, and reports
2. collect and organize data
3. order numbers according to size
4. construct tables, graphs, charts, and reports
5. determine mean, mode, median, and range for a given set of data

C. Concepts, operations, checks, and interpretations

The student will:

1. use appropriate mathematical vocabulary

2. interpret and construct two-dimensional scale drawings
3. identify basic geometric shapes and figures, their parts and properties
4. use and solve basic geometric formulas
5. use coordinate systems to determine locations
6. construct basic geometric figures
7. identify the sides of a right triangle
8. use the relationships of the sides of right triangles to find missing parts
9. classify lines by position: intersecting, parallel, perpendicular
10. evaluate formulas
11. solve equations
12. solve problems individually and as a member of a group

D. Measuring skills to obtain data necessary to solve relevant problems

The student will:

1. identify the metric units of measure
2. express metric equivalent linear units, liquid units, mass (weight) units and volume units
3. find surface area using metric units
4. find volume using metric units
5. identify English units of measure
6. express English equivalent linear units of measure, liquid units, weight units, and volume units
7. find surface area using English units
8. find volume using English units
9. add, subtract, multiply and divide English units
10. add, subtract, multiply and divide metric units

11. express English and metric equivalent linear units, liquid units, weight units, and volume units

12. select and use appropriate instruments to make linear, liquid, weight, and volume measurements

13. identify the degree of precision of a measurement

14. select and use appropriate instruments to measure time and temperature

15. calculate measures appropriate to the identified vocational area

16. use specific instruments and units appropriate to the identified vocational area

17. determine the area and circumference of a circle

18. determine the volume of rectangular solids, and cylinders

19. measure angles

E. Calculators and computers

The student will:

1. use a calculator for time consuming calculations and to verify solutions

2. use computer programs appropriate to the identified vocational area for problem solving, record keeping, report preparation and graph construction

F. Consumer Skills

The student will:

1. calculate income, given rate and time, or piece or commission rate

2. use banking skills related to checks, check registers, deposit slips, and savings accounts

3. reconcile bank statements

4. calculate interest

5. identify different types of consumer credit and state the purpose for each

6. use skills to purchase and operate vehicles and compare to cost of alternative transportation
7. use maps
8. compute costs of home ownership
9. compute costs of alternatives to home ownership
10. compute federal, state, and local income taxes
11. compute premiums for various types of insurance
12. compare various types of related insurance
13. develop a personal budget
14. use skills for comparative shopping

APPLIED ACADEMICS

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11TH GRADE CURRICULUM

The following instructional activities are divided by grade level and are intended to assist you in teaching the objectives in the graded course of study. As supplements to the activities, instructional information is given in the introduction, philosophy and goals sections at the beginning.

BEST COPY AVAILABLE

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ORIENTATION Time Allotment: 5 days (1-5) Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
define and demonstrate understanding of school/ classroom/lab rules, basic practices, procedures.	-read and discuss school-classroom/lab rules, basic practices and procedures.	-read and discuss the school rules. -discuss the class rules for the mathematics and electronics classrooms.	exhibit an understanding of school rules. identify and correctly interpret class rules and regulations.
demonstrate safe and proper conduct in the classroom/lab.	-tour lab and "role play" appropriate behavior of safe and proper conduct.	-practice fire and weather emergency drills.	become familiar with the building structure for fire drill and weather emergency situations.
display proper understanding of safety/fire equipment - location, application and use.	-practice using safety/fire equipment.	-coordinate with electronics teacher. -discuss the correlation between the mathematics class and the electronics class.	understand the overall objectives of the course. understand classroom procedures and expectations.
follow proper emergency evacuation/drill procedures.	-practice emergency evacuation drill procedures.	-discuss classroom procedures, course requirements, grading, exam requirements and general expectations.	understand the application of mathematics to determine wages or salaries.
complete necessary forms for collection of personal/ emergency data.	-practice filling out forms for personal and emergency information.	-use current information and rates to calculate weekly, monthly or yearly wages available to persons employed in various electronics occupations. Film: "Wages And Production" (#3641)	
prepare goal statement, relating self-expectations upon completion of course.	-discuss Electronics/Microprocessor employment opportunities, personal and vocational goals.	Note: Academic and vocational teachers will coordinate activities.	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SAFETY IN THE LABORATORY Time Allotment: Day 6 (reinforcement throughout the year) Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction the student should be able t
make a list of safety rules for both the classroom and laboratory work areas.	-make posters displaying safety rules for both classroom/lab areas.	-discuss electrical safety from a "mathematical" viewpoint. (For example, just 1/10 of an ampere of electrical current can cause death to a human being while the current "available" from a typical electrical outlet can be as much as 30 amperes or more.)	understand the reasons for safety rules.
identify, by sorting, safe and unsafe, devices.	-discuss safe and unsafe devices.	-make a safety poster for the mathematics classroom using a safety or danger fact similar to the one mentioned above.	
demonstrate first level of care in case of electrical shock.	-practice procedure for first level of care in case of electrical shock.	Note: Academic and vocational teachers will coordinate activities.	
identify and list potential safety hazards in the classroom/lab areas.	-discuss potential safety hazards.		
PARTS AND SYMBOLS Time Allotment: Day 7 Given the proper instruction, the student should be able to:	Students will:		
inventory training console, list missing items.	-complete inventory per student guide (Chapt. 2)	(cont. on next page)	(cont. on next page)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
PARTS AND SYMBOLS, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
relate items and components to proper symbol by identification and matching components to symbol.	-read and study wiring procedures (Chapt. 2).	-insert the proper symbol (+,-, x or ÷) to make true mathematical statements when such symbol has been omitted from a mathematical statement pertinent to electronics. E.g. (120 volts ? 24ohms = 5 amperes).	understand the use of mathematical symbols to indicate an operation or specif a relationship between two numbers or quantities.
match names of items to proper related graphic symbols.		-insert the proper symbol (= or ≠) to make true mathematical statements in electronics applications.	
describe wiring procedures, i.e., name two reasons for laying out wiring in a neat and orderly manner and list two possibilities for creating an accidental short circuit on the breadboard.		-insert the proper symbol (=, > or <) to make true mathematical statements in electronics applications.	
list the source of power at the lab station.	-discuss sources of power at lab stations.	Note: Academic and vocational teachers will coordinate activities.	
BASIC ELECTRICITY	Students will:		
Time Allotment: Day 8			
Given schematics of a carbon atom students should be able to:			
label the nucleus, protons, electrons.	-memorize the units of measurement used in electricity and Ohm's Law Formulae.	-name several mathematical units used in everyday life, (e.g. pounds, feet, gallons, etc.) (cont.)	demonstrate an understanding of the term "units." (cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BASIC ELECTRICITY, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
Identify by labeling hydrogen, helium, oxygen, iron, copper, lead.	-take notes on carbon atom, hydrogen, helium, oxygen, iron, copper and lead.	-name several mathematical units used in electronics application (e.g., volts, ohms, amperes, etc.).	
Given rubber, plastic, glass, paper, mica, copper, silver, and aluminum the students will be able to:		-compare common mathematical units with electronics units (e.g. the "pound" and the "volt" are both units of "force."	
separate conductors and insulators.		-write Ohm's Law in three different ways.	demonstrate a basic understanding of Ohm's Law.
list the specific resistances of the conductors and insulators.	-complete worksheet on specific resistances of conductors and insulators.	-discuss and understand the fact that the application of Ohm's Law requires one of two operations, either multiplication or division.	
Given the ECI Trainer, the students will be able to:		Note: Academic and vocational teachers will coordinate activities.	
wire a series circuit to demonstrate current flow, measure IR drop.	-define and discuss series and parallel circuits.		
wire a parallel circuit to demonstrate that voltage is the same across all branches.			

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
POWER SUPPLIES Time Allotment: Day 9 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction the student should be able t
construct a simple primary cell battery.	-draw a schematic of a simple primary cell battery.	-learn the "Order of Operations" rule.	understand the "Order of Operations" rule.
connect four single cell batteries in series to produce a six-volt output.	-explain how four single cell batteries in series produce a 6-volt output.	-discuss the effects of "grouping symbols" on the application of the rule.	understand the effect of "grouping symbols" on the order of operations.
measure the output of the above batteries.		-practice the "Order of Operations" rule.	perform mathematical operatio in the proper order to get an answer which is mathematicall correct.
measure the currents produced when the above batteries are connected to a load.		-work various problems pertinent to electronics in which "Order of Operations" is significant.	
measure the currents produced by solar cell, thermocouple.	-read chapter on Power Supplies.	Note: Academic and vocational teachers will coordinate activities.	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ELECTRICAL CIRCUITS Time Allotment: Days 10-12 Given the proper instruction the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a complete circuit.	-identify by labeling components of a basic circuit. -identify by labeling source of problem circuit on schematics.	-write Ohm's Law in three different ways. -discuss and understand the fact that the application of Ohm's Law requires one of two operations, either multiplication or division.	properly interpret and apply Ohm's Law.
demonstrate open and closed circuits by application of voltage to light indicator lamp.	-discuss the relationship of E, I and R (Ohm's Law).	-work various problems using Ohm's Law.	
demonstrate the relationship of voltage, current and resistance in an electrical circuit.	-state Ohm's Law 3 ways mathematically.	Note: Academic and vocational teachers will coordinate activities.	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SERIES AND PARALLEL CIRCUITS Time Allotment: Days 13-18 Given the proper instruction the student should be able to:	Students will:	Students will:	Given the proper instruction the student should be able t
connect a complete series circuit loop, identify and label the components used.	-identify and label components in a series circuit loop (schematic).	-discuss early need for mathematics. (specifying a quantity, counting, measurement, etc.).	understand the development o mathematics through the ages
draw a series circuit diagram; include lamps, switch, and source using appropriate graphic symbols.	-draw a series circuit diagram; include lamps, switch, and source using appropriate graphic symbols.	-discuss early number systems such as Roman Numerals.	
connect a two-path parallel circuit, using two lamps.	-connect a two-path parallel circuit, using two lamps.	-discuss ancient accomplishments that could not have been achieved without mathematics. (e.g. The Pyramids).	
draw an example of a compound using five pilot lamps and a source.	-draw an example of a compound using five pilot lamps and a source.	-make a table of squares from 1 - 12.	demonstrate the meaning of exponents.
calculate shunt and multiplier resistance values.	-calculate shunt and multiplier resistance values.	-make a table of square roots (of perfect square numbers) from 1-144.	use a table to find squares and square roots (verify with calculator).
connect voltmeter to demonstrate I-R (voltage) drops.		-discuss use of exponents in electronics.	raise a number to a power when the exponent is a whole number (with/without calculator).
connect ammeters to demonstrate: current glow in a cenes circuit. current division in parallel circuits.		-work various electronics problems involving the use of exponents. Films: "In Search of Pyramid Secrets" (#3794). "Big Numbers: Little Numbers" (#309) Note: Academic and vocational teachers will coordinate activities.	Note: Students will complet the objectives for vocationa applied General Math III.

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ELECTRICITY CONCEPTS Time Allotment: Days 18-26 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction the student should be able t
measure voltages and currents in electrical circuits.	-define and discuss measurement, voltages and currents.	-measure lines (on paper) to the nearest 1/16" using a ruler.	demonstrate a basic understanding on linear measurement.
measure voltages and currents in both series and parallel circuits.	-define and discuss series, parallel circuits, voltage/current.	-measure lines (on paper) to the nearest 1/32" using a steel scale.	read a rule to 1/16".
determine values of divisions on scale.	-practice determining values of divisions on scale.	-measure the classroom (length and width) to the nearest foot and nearest inch using a steel tape.	read a steel scale to 1/32".
coordinate the scale divisions with the meter range setting to determine actual meter readings.	-practice using the meter to determine meter readings.	-measure various items in the classroom, (desks, tables, etc.) with a specified accuracy.	read non-linear scales.
maintain appropriate measurement charts.	-complete a number of measurement charts.	-measure various electronics equipment or components to the nearest 1/32" using a steel scale.	read meters.
		-practice "reading" values at indicated points on a logarithmic or non-linear scale.	Note: Students will complete the objectives for vocational applied General Math III.
		-practice reading various electronic meters (voltmeter, ohmmeter, ammeter, etc.).	
		(cont.)	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
Electricity Concepts (cont.)		Students will: Films: "Weights and Measures" (#1937) "Measuring-Steel Scale" (#801) Note: Academic and vocational teachers will coordinate activities.	Given the proper instruction, the student should be able to:

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RESISTANCE AND RESISTORS Time Allotment: Days 26 & 27 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
use the ohmeter to measure the resistances of various components.	-measure the resistance of various components.	-measure various angles (on paper) using a protractor. -construct various angles (on paper) using a protractor.	demonstrate a basic understanding of angular measurement. measure angles to the nearest degree using a protractor.
express the resistance of given ohms in kilohms and megohms.	-convert resistance given in ohms to kilohms and megohms.	-measure specified angles on various drawings pertinent to electronics.	construct angles using a protractor.
apply the resistor color code to determine the resistance and tolerance resistors.	-practice reciting and memorizing the resistor color code.	-make a drawing of an electronic component (e.g. instrument panel) with specified angles.	
construct a circuit to use a combination of switches and potentiometers to control current and adjust voltages.	-practice using a potentiometer to control and adjust voltages.	Note: Academic and vocational teachers will coordinate activities.	
	-draw a diagram of circuits using a combination of switches.		Note: Students will complete the objectives for vocational applied General Math III.

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RESISTIVE CIRCUITS Time Allotment: Days 28-30 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
calculate the total resistance of a number of resistors in series.	-complete tables showing total resistance for a variety of numbers of resistors in series.	-read and interpret various tables to obtain statistical information. -read and interpret various tables to obtain technical information needed for electronics applications.	understand the use of tables to obtain, compile or interpret statistical or technical information.
verify these calculations in specific resistor combinations (series, parallel and compound circuits).	-identify and define specific resistor combinations. (Worksheets)	-use a "copper wire table" to determine the total resistance of a specified length of wire when given the "Gage No." of the wire.	
calculate the total resistance of equal resistors in parallel.	-practice calculation for R_T of equal resistors in parallel.		
use ohmmeter to verify these calculations in specific combinations.	-practice using ohmmeter.	Note: Academic and vocational teachers will coordinate activities.	
calculate the total resistance of compound resistive circuits.	-define, identify and calculate R_T for compound resistive circuits.		
use ohmmeter to verify these calculations in specific resistor combinations.	-practice using ohmmeter.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
NORTON, THEVENIEN THEOREMS Time Allotment: Days 31-35 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
apply Norton's, Thevenien's Theorems to simplify complex circuits.	-take notes on Norton, Thevenien Theorems. -practice applying formulas.	-use formulas to solve various mathematical problems (finding area or perimeter, the distance formula D = rt, etc.). -use formulas to solve problems pertinent to electronics (Ohm's Law, the power formula P = EI, etc.).	substitute numbers for variables. use formulas to solve problems.
complete a circuit analysis on various types of circuits.	-explain circuit analysis.		
compare the results of the mathematical analysis to measured values to verify the validity of the theorems.			Note: Students will complete objectives for vocational applied General Math III.
list an advantage of each theorem.	-define and practice using mathematical analysis and measured values of each theorem.		

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ELECTRICAL POWER AND ENERGY Time Allotment: Days 36-42 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
calculate the energy delivered to a resistor carrying a current of different amps over a variety of timeperiods . (Voltage across the resistor will also vary.)	-complete vocabulary worksheet on amps, resistor, power rating, watt-hour.	-read and interpret various graphs containing general information. -construct various graphs to show general information. -read and interpret various graphs containing information related to electronics.	read and interpret bar graphs, circle graphs, and line graphs. construct bar graphs, circle graphs and line graphs.
plot a graph of power dissipation.	-lecture on plotting a graph, calculating for power used, power dissipation.	-construct various graphs to show information related to electronics. -read a graph of "power dissapation." -plot a graph of "power dissapation."	
calculate power for various resistances.			
determine the power dissipation capabilities of resistors.			
determine the required power rating of various resistors.		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete objectives for vocational applied General Math III.
make a graph showing watt-hour meter dial readings.	-make a graph showing watt-hour meter dial readings.		
prepare a bill for the consumption of electricity using the power formula.	-prepare a bill for consumption of electricity using the power formula.		

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
MAGNETISM Time Allotment: Day 43 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
draw diagrams of magnets and their magnetic fields with like poles adjacent and with unlike poles adjacent.	draw diagrams of magnets and their magnetic fields with like poles adjacent and with unlike poles adjacent.	-find the mean (average) of various groups of numbers pertinent to electronics.	demonstrate an understanding of the term "mean." determine the "mean" from a given set of numbers.
illustrate the effect of earth's magnetic field on a compass.	describe the effect of earth's magnetic field on a compass.		
demonstrate two methods of magnetizing a nail.			
demonstrate the demagnetization of a screwdriver.			Note: Students will complete objectives for vocational applied General Math III.
demonstrate permeability if you were given 1 400 Ohm Coil, 1 nail and 1 AC-DC power supply.	define demagnetization, permanent magnet, permeability, ferromagnetic, non-ferromagnetic.		
demonstrate magnetization and demagnetization of materials if you were given 1 400 Ohm Coil, 1 nail and 1 AC-DC power supply.			

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
MAGNETISM, (Continued) list two ferromagnetic substances and two non-ferromagnetic substances.	Students will: -list two ferromagnetic substances and two non-ferromagnetic substances.	Students will:	Given the proper instruction, the student should be able to:
ELECTROMAGNETISM Time Allotment: Day 44 Given the proper instruction, the student should be able to: demonstrate a magnetic field around a current-carrying wire. demonstrate electromagnetism by completing a variety of experience. construct a circuit to use a relay to control a lighting circuit. demonstrate the use of an electromechanical switch. demonstrate the principle of electromagnetic induction using wires and coils in magnetic fields.	Students will: -complete all experiments on electromagnetism as assigned -define and apply all necessary vocabulary; magnetic, electromagnetism, electromechanical.	-find a median of that set of numbers from a given "set" of numbers pertinent to electronics. -find the mode (if any) of a given set of numbers pertinent to electronics. Film: "Mean, Median and Mode" (#915) Note: Academic and vocational teachers will coordinate activities.	demonstrate an understanding of the term "median". determine the median when given a set of numbers. demonstrate an understanding of the term "mode." determine the mode from a given set of numbers. Note: Students will complete objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ELECTROMAGNETISM, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
list three factors that determine the amount of current induced into a conductor moving in a magnetic field.	-list three factors that determine the amount of current induced into a conductor moving in a magnetic field.		
demonstrate motor action using the principle of electromagnetic induction.			
list three uses of current-carrying conductors moving in a magnetic field.	-list three uses of current-carrying conductors moving in a magnetic field.		
	-complete Study Guide, "Electromagnetism".		
APPLICATION OF ELECTRO-MAGNETISM	Students will:		
Time Allotment: Day 45			
Given the proper instruction, the student should be able to:			
construct circuits to demonstrate the operational principles of electric bells, buzzers and relays.	-observe demonstrations on Objective 1.	-discuss the uses of statistics.	illustrate some uses of statistics.
		-discuss the misuses of statistics.	state some misuses of statistics.
		-compile some statistical information pertinent to electronics (e.g. the number of persons employed in electronics occupations in each of the years from 1975 to the present) (cont.)	Note: Students will complete the objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
APPLICATION OF ELECTROMAGNETISM, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able to:
observe and record the operation of a buzzer circuit.	-observe demonstration on Objective 1.	-present this information in pictorial form (bar graph, line graph, etc.).	
demonstrate the use of the relay to control circuit operation.	-draw a schematic illustrating same.	Note: Academic and vocational teachers will coordinate activities.	
list at least three advantages for the use of relays in circuits.	-list at least three advantages for the use of relays in circuits.		
ALTERNATING CURRENT	Students will:		
Time Allotment: Days 46-50			
Given the proper instruction the student should be able to:			
apply a low-voltage A.C. signal to the input terminals of the oscilloscope.	-complete Study Guide on A.C.	-use construction paper "bars" to identify and define complex numbers.	define complex numbers
adjust the various controls until one or more sine waves are stationary on the face of the scope.		-use construction paper "bars" to illustrate and practice the four operations with complex numbers.	Add two or more complex numbers.
		(cont.)	(cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ALTERNATING CURRENT, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
construct a circuit to demonstrate the fundamental concepts of alternating current.	-complete schematics of variety of circuits.	-work various addition, subtration, multiplication and division problems pertinent to electronics.	find the difference between two complex numbers.
graph a sine wave to illustrate the various characteristics of amplitude period, alteration, frequency, peak, and peak-to-peak voltages.	-define vocabulary.	-work various percent problems pertinent to electronics.	find the product of two complex numbers.
use oscilloscope to measure the peak-to-peak values as applied to sine waves.	-explain an oscilloscope.	Films: Donald in Mathmagic Land (#499) Language of Mathematics (#1852) Percent and Percentage (#5606)	find the quotient of two complex numbers.
calculate the peak-to-peak value of a sine wave with a peak voltage of 120 volts A.C.	-define peak-to-peak value.	Note: Academic and vocational teachers will coordinate activities.	find a percent of a number.
measure RMS voltages with voltmeter.	-discuss RMS voltages.		use percents in data-gatherin and problem-solving situation
calculate the RMS and average voltages in circuit analysis.			Note: Students will complete the objectives for vocational applied General Math III.
use the oscilloscope to view and identify various waveforms, square wave, sawtooth.	-explain waveforms.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INDUCTANCE Time Allotment: Days 51 thru 53 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instructior the student should be able t
construct an inductive circuit to demonstrate counter EMF.	-define and explain an inductive circuit. (EMF and DC)	-practice using formulas as relevant to the electronics teachers objectives and activities.	Note: Students will complet the objectives for vocationa applied General Math III.
construct an inductive circuit to demonstrate the basic properties of inductance as applied to DC circuits.	-define and explain how coils operate.	Note: Academic and vocational teachers will coordinate activities.	
construct a circuit to demonstrate how coils operate with AC applied.	-practice graphing characteristics of RL circuits and phase angle.		
draw a graph to demonstrate the characteristics of RL circuiters and phase angle.	-practice using formulaes - (worksheets).		
use impedance formulae to verify the relationships between voltage, current and impedance in RL circircuits.	-practice with formulae in series and parallel RL circuits - (worksheets).		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INDUCTANCE, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
verify the formula relationships with measurements in series and parallel RL circuits.			
demonstrate the two basic uses of inductors.	-explain the two basic uses of inductors.	-practice the various calculations relevant to the electronic teachers objectives and activities.	Note: Students will complet the objectives for vocationa applied General Math III.
CAPACITANCE	Students will:		
Time Allotment: Days 54-57		Note: Academic and vocational teachers will coordinate activities.	
Given the proper instruction, the student should be able to:			
construct a circuit to demonstrate the basic operation of capacitors and factors that determine the amount of charge.	-complete Study Guide on "Capacitance". (Directed Reading Activity)		
verify these factors by charging and discharging capacitors with different voltages.	-practice various calculations		
perform various calculations to determine energy stored in a capacitor.	-complete all experiments. (See ECI Student Handbook)		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CAPACITANCE, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
calculate the total capacitance of parallel and series-connected capacitors.			
perform calculations with reference to various combinations.			
CAPACITANCE CIRCUITS	Students will:		
Time Allotment: Days 58-61			
Given the proper instruction, the student should be able to:			
construct a circuit using AC power to demonstrate how capacitors operate with AC voltages.	-read chapter on capacitance circuits.	-practice the various calculations relevant to the electronics teachers objectives and activities.	
make calculations to determine the characteristics of RC circuits using AC power.	-complete Study Guide.	Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete the objectives for vocational applied General Math III.
calculate capacitive reactances in series and the voltages in series RC circuits.	-practice calculations (worksheets).		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CAPACITANCE CIRCUITS, (Continued)	Students will:	Students will:	Given the proper instructio the student should be able
construct circuits to verify these calculations with measurements.	-practice drawing variety of circuits and label.		
calculate capacitive reactances in parallel, also the currents and impedances of parallel RC circuits.	-explain (discuss) applications for capacitors in circuit operation.		
construct circuits to verify these calculations with measurements.			
list three applications for capacitors in circuit operation.	-list three applications for capacitors in circuit operation.		
RLC CIRCUITS Time Allotment: Days 62-65 Given the proper instruction, the student should be able to:	Students will:		
calculate various electrical quantities in series RLC circuits.	-review formulae for calculations.	-locate integers (positive and negative) on a number line. (cont.)	use the number line to identify and order integers. (cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RLC CIRCUITS, (Continued)	Students will:	Students will:	Given the proper instructior the student should be able t
calculate various electrical quantities in parallel RLC circuits.	-define and discuss electrical quantities.	-locate mixed numbers (positive and negative) on a number line.	use the number line to identify and order integers.
construct waveform graphs to describe the characteristics of series and parallel resonant circuits.	-practice drawing waveform graphs.	-locate irrational numbers (positive and negative) on a number line.	distinguish between rational and irrational numbers.
calculate circuit quantities for both series and parallel resonant circuits.	-practice identifying series and parallel resonant circuits.	-use a number line to add signed numbers.	add signed numbers using a number line.
measure the impedance of the AC power supply.	-explain impedance.	-use a number line to subtract signed numbers.	subtract signed numbers using a number line.
		Films: Number Line - Whole Numbers (#734) Number Line - Fractions (#4435)	
		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complet the objectives for vocationa applied General Math III.

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
AC POWER Time Allotment: Days 66-69 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instructior the student should be able t
construct a circuit to observe and describe the characteristics and values of AC power in resistive circuits.	-complete directed reading for chapter on AC power.	-develop, learn, apply and practice the rule for adding signed numbers. -learn, apply and practice the rule for subtracting signed numbers.	add signed numbers. subtract signed numbers. multiply signed numbers. divide signed numbers.
calculate the values concerned with AC power in series circuits.	-complete Student Workbook exercises.	-learn, apply and practice the rule for multiplying signed numbers.	perform mixed and combination operations with signed numbers.
construct circuit to verify these calculations with measurements from RL and RC series circuits.	-complete Study Guide/worksheets on AC power.	-learn, apply and practice the rule for dividing signed numbers.	
calculate the values concerned with AC power in parallel circuits.	-practice calculations using necessary formulae.	-review and practice "order of operations" rules. -practice various mixed and combination operations with signed numbers.	
construct circuits to verify these calculations with circuits measurements.	-practice identifying variety of circuits.	-work various problems pertinent to electronics using signed numbers.	
		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complet the objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
TRANSFORMERS Time Allotment: Days 70-74 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction the student should be able t
construct circuits to demonstrate the basic operating principles of transformers; construct circuits to demonstrate the basic operating principles with mutually coupled coils.	-define turns, voltage, and current ratios in transformers	Note: The objectives and activities from the previous page are continued.	
make calculations to determine the various ratios of a given transformer.	-list three possible methods to decrease transformer losses.		
demonstrate turns, voltage, and current ratios in transformers.	-draw circuits to demonstrate the applications and transformer losses.		
calculate the efficiency of a transformer from measured and calculated circuit values.	-list four applications of transformers.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
MOTORS Time Allotment: Days 75-79 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction the student should be able t
construct a circuit to observe basic operating principles of DC motors. connect a circuit demonstrating the effect of reversing the current direction in a DC motor armature. construct a circuit to demonstrate the effects that the magnetic fields have on the speeds of DC motors. construct a circuit to observe and demonstrate the operation of AC motors.	-make a drawing and describe the effect of commutators in a motor. -make a list to relative characteristics of DC and AC motors. -list the advantages of both the AC and DC motors.	-practice substituting numbers for variables and simplifying the resulting expression. -discuss the similarity of "substitution" in algebraic expressions to the use of "formulas." -practice translating word phrases into algebraic expressions. -translate word phrases pertinent to electronics into algebraic expressions or formulas using correct abbreviations or symbols. Films: "Language of Algebra" (#2322) "Algebra, An Introduction" (#312) Note: Academic and vocational teachers will coordinate activities.	substitute numbers for variables and simplify the resulting expression. write mathematical expressions for simple word phrases using addition, subtraction, multiplication and division. Note: Students will complete objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
GENERATORS Time Allotment: Days 80-84 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a circuit to demonstrate the basic operating principles of AC generators.	-draw a diagram to illustrate how a generator is constructed	-learn, apply and practice the addition axiom to solve equations.	solve addition or subtraction equations involving one operation.
use the oscilloscope to analyze the operation of an AC generator through a complete cycle of operation.	-list basic operating principles of AC generators.	-learn, apply and practice the subtraction axiom to solve equations. -learn, apply and practice the multiplication axiom to solve equations.	solve multiplication or division equations involving one operation. solve complex equations involving two or more operations.
construct a circuit to operate a motor and a generator as a system.	-list basic operating principles of DC generators.	-learn, apply and practice the division axiom to solve equations.	
construct a circuit to observe various aspects of the output of a generator.		-apply two or more axioms to solve complex equations. -apply equation-solving techniques to problems pertinent to electronics.	
construct a circuit to demonstrate the basic operating principles of DC generators.		Films: "Solving Equations" (#6134) "Sentences and Solution Sets" (#2299) Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete the objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SEMICONDUCTORS Time Allotment: Days 85-90 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
make a drawing to demonstrate how conduction takes place in semiconductor materials.	-make a drawing to demonstrate how conduction takes place in semiconductor materials.	Note: The objectives and activities from the previous page are continued.	
make a drawing to illustrate N-type and P-type semiconductors. (Show how sections are made.)	-make a drawing to illustrate N-type and P-type semiconductors. (Show how sections are made.)		
make a drawing to illustrate how diode rectifiers are made. (Explain how forward and reverse affects the operation.)	-make a drawing to illustrate how diode rectifiers are made. (Explain how forward and reverse affects the operation.		
construct a circuit to use the diode as a half-wave. construct a full-wave rectifier circuit and explain its operation.	-explain the use of the diode as a half-wave; full-wave rectifier circuit.		
construct a circuit to demonstrate the operation of an NPN transistor. Observe and explain its [illegible].	-explain NPN, PNP transistors.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SEMICONDUCTORS, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
construct a circuit to demonstrate how PNP transistors operate as amplifiers.			
connect a two-transistor circuit, make measurements, and calculate gains of the transistors.			
LAB SAFETY	Students will:		
Time Allotment: Days 90-91			
Given the proper instruction, the student student should be able to:			
identify and locate sources of power at the laboratory station.	-list the sources of power at the laboratory station.	-identify the point using an ordered pair of numbers in a coordinate system.	identify quadrants, origin, and axes.
identify and correct possible hazards.	-draw up a list of safety rules for the lab area. -draw up a list of potential safety hazards in your lab area.	-locate, plot and properly label the point (ordered paid) in the coordinate system whose description has been given.	identify an ordered pair of intergers from a point on a grid.
demonstrate a good method of circuit layout.	draw at least two circuits to demonstrate good and poor methods of circuit layout.	-identify any point by quadrant location.	identify the quadrant location for an ordered pair of numbers.
		(cont.)	(cont.)

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
Lab Safety (cont.)		Students will: -relate the coordinate system to graph constructions required in electronics. Note: Academic and vocational teachers will coordinate activities.	Given the proper instruction, the student should be able to: plot a point on a grid when given an ordered pair of numbers. Note: Students will complete the objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SYMBOLS Time Allotment: Day 92 Given the proper instruction, the student should be able to: match graphic symbols to components. read and interpret circuit diagrams.	Students will: -complete worksheets on graphic symbols. -read and interpret circuit diagrams. -complete worksheet exercises.	Students will: Note: The activities and objectives from the previous page are continued.	Given the proper instruction the student should be able to
INSTRUMENTS I Time Allotment: Days 93-94 Given the proper instruction, the student should be able to: construct a circuit to demonstrate basic operating characteristics of a low voltage power supply. explain the operation of a low voltage power supply.	Students will: -discuss characteristics of a low voltage power supply. -explain the operation of a low voltage power supply.		

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INSTRUMENTS I **construct a circuit to demonstrate basic operating characteristics of a multimeter.** use the multimeter to measure resistance, voltage, and current in operating circuits. construct a circuit to demonstrate the basic operating characteristics of an oscilloscope. use the oscilloscope to measure AC and DC voltage in an operating circuit. . .	Students will: -discuss operating characteristics of a multimeter. -discuss operating characteristics of an oscilloscope. -explain uses of an oscilloscope.	Students will: -discuss linear equations. -practice the identification of linear equations. -practice rewriting linear equations into "usable" form. -practice making "tables" showing corresponding x and y values. -graph and properly label various linear equations on a standard coordinate system. -discuss linear equations as represented graphically in electronics applications. -practice reading a multimeter and oscilloscope as relevant to the electronics teacher's objectives.	Given the proper instruction, the student should be able to define linear "equation." recognize and understand the "standard form" of a linear equation (ax + by = c). graph linear equations on a standard coordinate system (coordinate plane). Note: Students will complete objectives for vocational applied General Math III.
INSTRUMENTS II Time Allotment: Days 95-96 Given the proper instruction, the student should be able to: connect an oscilloscope to demonstrate the basic operating characteristics of a signal generator.	Students will: -take notes on the procedure for connecting an oscilloscope.	Note: Academic and vocational teachers will coordinate activities. Note: The activities and objectives listed above are continued.	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INSTRUMENTS II, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a circuit to demonstrate the basic principles of a signal tracing.	-draw a circuit to illustrate the basic principles of a signal tracing.		
DIODES	Students will:		
Time Allotment: Day 97			
Given the proper instruction, the student should be able to:			
construct a circuit to observe the effect of forward and reverse bias voltage on a semiconductor diode.	-define forward and reverse bias voltage, diode curve, Zener Diode.	-practice reading a micrometer.	read a micrometer properly.
		-practice reading a vernier caliper.	read a vernier caliper properly.
measure and use the voltage and currents obtained in forward and reverse biasing a diode to plot a diode characteristic curve.		-measure the thickness of various items (paper, sheet metal, a paper clip, etc.) using a micrometer.	use a micrometer or vernier caliper for precision measurement.
		-measure the length, width, thickness or diameter of various electronics components or parts using a vernier caliper.	Note: Students will complete the objectives for vocational applied General Math III.
draw a schematic symbol of a Zener Diode.	-draw a schematic symbol of a Zener Diode.	-measure the diameter of various sizes of copper wires using a micrometer.	
		(cont.)	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIODES, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
measure the forward and reverse bias voltage of a Zener diode.		-compare the measured diameter with the diameter specified in a "copper wire table" for that gage number wire.	
plot a characteristic curve of a Zener Diode.	-plot a characteristic curve of a Zener Diode.		
RECTIFIERS	Students will:		
Time Allotment: Day 98			
Given the proper instruction, the student should be able to:			
construct a half-wave rectifier circuit.	-draw a half-wave rectifier circuit.	Note: The activities and objectives from the previous page are continued.	
measure the magnitude of the output voltage and the frequency of the output waveform through the use of an oscilloscope.	-draw a full-wave rectifier circuit.		
construct a full-wave rectifier circuit. Measure the magnitude of the output voltage and frequency of the waveform through the use of an oscilloscope.			

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RECTIFIERS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a full-wave bridge rectifier circuit.	-draw a full-wave bridge rectifier circuit.		
measure the magnitude and frequency of the output waveform through the use of an oscilloscope.			
construct three types of rectifiers using ripple filters.	-discuss three types of rectifiers using ripple filters.		
measure the output ripple voltage of each of the above types of filtered circuits using an oscilloscope.			
VOLTAGE REGULATORS	Students will:		
Time Allotment: Days 99-101			
Given the proper instruction, the student should be able to:			
construct a circuit to demonstrate the operation of a shunt voltage regulator.	-explain the operation of a shunt voltage regulator.	-measure the radius, diameter and circumference of various circular cutouts. -calculate the "area" of these same cutouts. (cont.)	demonstrate an understanding of the radius, diameter, circumference and area of a circle.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
VOLTAGE REGULATORS, (Continued)	Students will:	Students will:	Given the proper instruction the student should be able t
construct circuit to demonstrate the operation of a series voltage regulator.	-explain the operation of a series voltage regulator.	-calculate the diameter of a circle from a given diameter. -calculate the radius of a circle from a given diameter. -calculate the circumference of a circle from the given radius or diameter. -calculate the area of a circle from a given radius or diameter. -identify and measure the radius and/or diameter of various circles as shown on electronics drawings. -calculate the circumferences and area of that circle. Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete the objectives for vocational applied General Math III.

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CLAMPERS AND LIMITERS Time Allotment: Day 102 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a circuit which will clamp an operating voltage at a specified value.	-read related chapter in assigned text.	Note: The activities and objectives from the previous page are continued.	
draw a diode clamper, functional diagram.	-draw a diode clamper, functional diagram.		
construct a basic as clippers circuit and explain its action.			
construct a basic limiter circuit and explain its action.			
draw a graph of the observed waveforms on the oscilloscope graticule. --clamper --limiter --clipper	-draw a graph of the observed waveforms on the oscilloscope graticule.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
TRANSISTORS I Time Allotment: Days 103-106 Given the proper instruction, the student should be able to: draw the graphic symbol for an N-P-N transistor. draw a schematic diagram of a PNP transistor; identify its leads. use an ohmmeter to test transistors to determine if they are "opened" or "shortened".	Students will: - draw the graphic symbol for an N-P-N transistor. - identify the emitter, base and collector leads. - draw a schematic diagram of a PNP transistor; identify its leads.	Students will: -calculate the area of various four-sided cutouts. -identify and name quadrilaterals as shown on an electronics or other drawing or blueprint. -calculate the area of these quadrilaterals. Note: Academic and vocational teachers will coordinate activities.	Given the proper instruction, the student should be able to define and explain the difference between rectangles, squares, parallelegrams and trapesoids. calculate the area of any of these figures when given the required dimensions. Note: Students will complete the objectives for vocational applied General Math III.
TRANSISTORS II Time Allotment: Days 107-110 Given the proper instruction, the student should be able to: connect several circuits and observe a transistor controlling current.	Students will:	-identify and name triangles cut from construction paper.	define triangles.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
TRANSISTORS II, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
draw a schematic identifying the transistor current flow.	-draw a schematic identifying the transistor current flow.	-identify and name triangles as shown on electronics or other drawings or blueprints.	identify acute, right, obtuse, scalene, isosceles and equilateral triangles.
measure input and output signal voltages in a circuit using an oscilloscope.		-calculate the area of triangles cut from construction paper.	calculate the area of a triangle when given the required dimensions.
chart results of a linear on oscilloscope graticule.	-chart results of a linear on oscilloscope graticule.	-calculate the area of triangles as shown on electronics or other drawings or blueprints.	
construct forward and reverse bias common-emitter and common-collector circuits.		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete objectives for vocational applied General Math III.
draw a graph to demonstrate voltage gain and phase relationships in common-emitter and common-collector circuits.	-draw a graph to demonstrate voltage gain and phase relationships in common-emitter and common-collector circuits.		
use manufacturers' specification charts to determine the safe operating conditions of a transistor as applied to its power rating.	-use manufacturers' specification charts to determine the safe operating conditions of a transistor as applied to its power rating.		
use formulae to calculate the collector current in various voltages.	-use formulae to calculate the collector current in various voltages.		

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
AMPLIFICATION Time Allotment: Day 111 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a circuit to gain a single-stage transistor amplifier. construct a single-stage transistor amplifier circuit. construct a cascaded amplifier circuit and measure cascaded amplifier.	-read the related chapter in the assigned text on transistor amplifiers. -draw and explain single-stage transistor amplifier circuit. -draw and explain a cascaded amplifier circuit.	-identify and describe various geometric solids by using a geometric solids demonstration kit. -identify and describe the uses and applications of these solids in electronics. -calculate the volume of various rectangular solids as shown on drawings. -calculate the volume of various cylinders, cones and spheres as shown on drawings. Films: Discovering Solids: Solids in the World Around Us (#310) Discovering Solids: Volumes of Cubes, Prisms and Cylinders (#2294) Note: Academic and vocational teachers will coordinate activities.	identify cubes, rectangular prisms, pyramids, cylinders, cones and spheres. determine the volume of rectangular solids. calculate the volume of cylinders and spheres. Note: Students will complete the objectives for vocational applied General Math III.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
PUSH-PULL AMPLIFIERS Time Allotment: Day 112 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
construct a push-pull amplifier circuit.	-define a push-pull amplifier circuit.	Note: The activities and objectives from the previous page are continued.	
	-explain waveforms and graphs.		
graph waveforms on oscilloscope graticule.	-graph waveforms on oscilloscope graticule.		
use an oscilloscope to observe and measure the input and output signals within the circuit of an operating push-pull class B amplifier.			
construct a push-pull amplifier circuit operating at class B.	-graph push-pull amplifier circuit.		

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
MOSFETS/FETS Time Allotment: Days 113-115 Given the proper instruction, the student should be able to: construct self-bias and voltage divider gate bias circuits.)bserve and chart the effects)f various biasing schemes on MOSFET operation. :onstruct a MOSFET amplifier :ircuit and chart the amplifier ;ain characteristics.)raw the input waveform on the)scilloscope graticule.)raw the output wafeform on the)scilloscope graticule. :onstruct a commonly used gain :ontrol circuit.)iagram the three basic MOSFET :ircuits: common source, :ommon gate and common gain. :onstruct a field-effect trans- stor amplifier. :hart the effect gate voltage ias on drain current. :hart the voltage gain and phase :elationship between the input .nd output per signal of a :ommon-source FET amplifier.	-draw the input waveform on the oscilloscope graticule. -draw the output waveform on the oscilloscope graticule. -diagram the three basic MOSFET circuits: common source, common gate and common gain. -use basic delivery skills in public speaking. -chart the effect gate voltage has on drain current flow. -chart the voltage gain and phase relationship between the input and output per signal of a common-source FET amplifier.	Students will: Note: The activities and objectives from the previous page are continued.	Given the proper instruction, the student should be able to:

108 (cont.)

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
MOSFETS/FETS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
draw the input waveform to an FET amplifier.	-draw the input waveform to an FET amplifier.		
chart the voltage gain, power gain, and phase relationship between the input and output signals of a source-follower amplifier.	-chart the voltage gain, power gain, and phase relationship between the input and output signals of a source-follower amplifier.	Note: The activities and objectives from the previous page are continued.	
draw the input-output waveforms to source-follower FET amplifier.	-draw the input-output waveforms to source-follower FET amplifier.		
PHOTOELECTRIC EFFECT	Students will:	Students will:	Given the proper instruction, the student should be able to:
Time Allotment: Days 116-117			
Given the proper instruction, the student should be able to:			
construct a basic photo-control circuit.		-identify "true" proportions by checking the cross products.	write the ratio of two quantities.
chart the effects of varying light intensities on typical relay control circuits.	-chart the effects of varying light intensities on typical relay control circuits.	-use "x" as the missing term in a porportion, use cross products to form an equation, then solve for "x".	use cross products to determine whether two ratios form a proportion.
		(cont.)	(cont.)

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
PHOTOELECTRIC EFFECT, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
illustrate the symbols for photoconductive cells, intrusion detector circuit, and basic construction of the photoconductive cell.	-illustrate the symbols for photoconductive cells, intrusion detector circuit, and basic construction of the photoconductive cell.	-solve proportions in which one or more of the terms is a mixed number.	use cross products to solve proportions.
construct a photoelectric isolation circuit.		-work various ratio and proportion problems pertinent to electronics.	understand that zero cannot be the denominator of a fraction or ratio.
chart an optically coupled output signal and draw the waveform on the oscilloscope graticule.	-chart an optically coupled output signal and draw the waveform on the oscilloscope graticule.	-relate ratio to the tools in a toolbox (or on a bench) e.g. what is the ratio of pliers to screwdrivers? What is the ratio of pliers to total number of tools?	Note: Students will complete the objectives for vocational applied General Math III.
		Film: Ratio and Proportion - Geometry (#1783)	
UNIJUNCTION TRANSISTORS/ THYRISTORS	Students will:	Note: Academic and vocational teachers will coordinate activities.	
Time Allotment: Days 118-122			
Given the proper instruction, the student should be able to:			
construct a circuit to determine the peak voltage of a UJT.		-use calculators to solve basic problems pertinent to electronics.	use a calculator for mathematical computation.
		-develop speed and accuracy on a calculator by using "timed drills." (cont.)	

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
UNIJUNCTION TRANSISTORS/ THYRISTORS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
schematically demonstrate the construction and operating characteristics of unijunction transistors.	-schematically demonstrate the construction and operating characteristics of unijunction transistors.	-solve "multi-step" problems by using a calculator and pushing keys in the proper sequence.	
construct a UJT relaxation oscillator.	-draw the waveforms generated by the circuit.	Films: Expanding Math Skills With a Mini-calculator -Introduction (#3376) -Classroom Management (3377) -Problem Solving (3378)	
construct a UJT-SCR dimmer circuit using a photocell as a light-controlled input element.	-draw a UJT-SCR dimmer circuit. -draw a phase-control circuit.		
construct a phase-control circuit using the unijunction transistor and silicon controlled rectifier (SCR).		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete the objectives for vocational applied General Math III.
IC OPERATIONAL AMPLIFIERS Time Allotment: Days 123-125	Students will:	Students will:	Given the proper instruction, the student should be able to:
Given the proper instruction, the student should be able to:			
list the basic characteristics of operational amplifiers.	-read related chapter in text and list the basic characteristics of operational amplifiers.	-make a scale drawing of the classroom. (cont.)	read and interpret scale drawings and blueprints. (cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
IC OPERATIONAL AMPLIFIERS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
calculate the gain of an operational amplifier.	-calculate the gain of an operational amplifier.	-read a drawing pertinent to electronics to identify or interpret specific dimensions as requested.	read and interpret scale drawings and blueprints.
measure the input and output voltage to check these calculations of gain.		-make a scale drawing of a piece of electronics equipment or an electronics component.	construct scale drawings.
list the basic applications for the op-amps.	-list the basic applications for the op-amps.	-discuss the uses of "approximate" numbers in calculations and the results and application of such calculations.	identify and use the rules for calculations with approximate numbers.
demonstrate the operation of two op-amp circuits.	-graph the operation of two op-amp circuits.	-estimate the number of floor tiles (1 ft. x 1 ft.) required to cover the floor of the classroom when given the length and width of the classroom.	interpret a drawing or blueprint and make an estimate of the quantities of various materials needed to complete the project or some portion thereof.
		-compare this to the exact answer determined by counting the tiles	
		-use electronics drawings or other drawings or blueprints to estimate the quantities of specific materials required to complete the project.	Note: Students will complete the objectives for vocational applied General Math III.
		Note: Academic and vocational teachers will coordinate activities.	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SERIES RESONANCE Time Allotment: 126-128 Given the proper instruction, the student should be able to: list the characteristics of a series resonant circuit. construct a series RLC circuit to demonstrate that series resonance results, when inductive and capacitive reactance, are equal. connect a parallel RLC circuit. Calculate the resonant frequency. chart the effects on this circuit at resonance.	Students will: -read related chapter on RCL Circuits-Series resonance. -list the characteristics of a series resonant circuit.	Students will: -use right triangles cut from construction paper to identify the legs and the hypotenuse. -use electronics or other drawings showing triangular sections to identify the legs and hypotenuse of these triangular sections. Note: Academic and vocational teachers will coordinate activities.	Given the proper instruction, the student should be able to define a right triangle. identify the parts (legs, hypotenuse) of a right triangle. Note: Students will complete the objectives for vocational applied General Math III.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
OSCILLATORS Time Allotment: Days 129-131 Given the proper instruction, the student should be able to: construct a circuit to demonstrate what effect a change in feedback has on the output of an oscillator. construct a circuit to demonstrate what effect a change in the tank circuit has on the output of an oscillator. construct circuits to compare the operation of the Armstrong, Hartley and Colpitts Oscillators.	Students will: -read and discuss related chapter on Oscillators: Colpitts, Crystal, Hartley, Pierce.	Students will: -use right triangles cut from construction paper to "solve" various right triangles, i.e., measure any two sides then calculate the measure of the third side. -use an electronics or other drawing or blueprint to choose any two dimensions of a triangular section. -calculate the third dimension by using the Pythagorean Theorem. -compare this answer with the dimension shown on the drawing. Films: Possibly So Pythagoras (3651) Pythagorean Theorem Geometry (#1784) Note: Academic and vocational teachers will coordinate activities.	Given the proper instruction, the student should be able to demonstrate an understanding of the theory and applications of the Pythagorean Theorem. compute the measure of the hypotenuse of a right triangle when given the measures of the legs. compute the measure of a leg of a right triangle when given the measure of the hypotenuse and the other leg. Note: Students will complete the objectives for vocational applied General Math III.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIGITAL GATES Time Allotment: Days 132-133 Given the proper instruction, the student should be able to: construct a basic electronic switching circuit. chart the operation of AND, OR, and inverting gates in digital applications. make a chart which shows how circuits are used to perform digital logic functions. identify the basic logic functions when used in combination of form NOR and NAND gates. construct circuits that perform the basic logic functions using only NAND gates.	Students will: -read manual chapter on Digital Gates. Chart the operation of AND, OR, and inverting gates in digital applications. -make a chart which shows how circuits are used to perform digital logic functions.	Students will: -label the three sides of the triangle properly when given a right triangle and specified reference angle. -write the ratios that describe the sine, cosine and tangent of the reference angle when given a right triangle, nominal dimensions and a specified reference angle. -use trigonometric tables to read the sine, cosine and tangent of various angles. -calculate the measures of the other acute angle and the other two sides when given a right triangle, the measure of one acute angle and the measure of any side. Note: Academic and vocational teachers will coordinate activities.	Given the proper instruction, the student should be able to define the refernece angle. define adjacent side, opposite side and hypotenuse. identify the six ratios that can be formed using the three sides of a right triangle and a specified reference angle. name the following ratios using their proper mathematical designation: ..sine .. cosine ..tangent ..co-tangent ..secant ..cosecant. understand the translation of these ratios into "trigonometric tables." use the sine, cosine and tangent ratios for problem solving. Note: Students will complete the objectives for vocational applied General Math III.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
TIMING CIRCUITS Time Allotment: Days 134-135 Given the proper instruction, the students should be able to: construct an astable multivibrator circuit using the 555 timer. construct a monostable delay circuit and a frequency divider using the 555 timer. construct a practical burglar alarm based on the properties of the 555.	Students will: -read and discuss chapter in Manual on 555 timer.	Students will: Note: The activities and objectives from previous page are continued.	Given the proper instruction, the student should be able to

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIGITAL TRAINER FAMILIARIZATION Time Allotment: Day 136 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to.
use the components of the Digital Electronics Trainer in accordance with the experiment requirements.	-read and complete experiment in Module A of Student Manual	-discuss place values as related to the decimal (base 10) number system.	understand place values as related to the decimal (base 10) number system.
identify the various parts of the Digital Electronics Trainer.	-identify the various parts of the Digital Electronics Trainer.	-discuss the significance and importance of "zero" in any number system.	understand the significance and importance of "zero" in any number system.
identify the individual circuit modules.		-discuss the difficulty of carrying out operations in a number system (such as the Roman Numeral System) that lacks a "zero."	understand the "construction" and interpretation of a place value table for a number system other than base 10.
explain the basic functions of the circuit modules.	-explain the basic functions of the circuit modules.	-identify and list the symbols to be used in various number systems including "new" symbols which must be introduced if the base of the number system is more than ten.	understand the symbols to be used in a number system other than the base 10 including the introduction of "new" symbols if required.
connect a ribbon cable from the Digital Display Module to Interface Module 1 and Module 2.		-practice "counting" in various number systems.	understand how "counting" would be done in a number system other than base 10.
use the wire strippers without marking the solid copper wire.		-discuss and practice some simple operations in various number systems.	understand how the basic mathematical operations (addition, subtraction, multiplication, and division) could be accomplished in a number system other than base 10.
		(cont.)	(cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIGITAL TRAINER FAMILIARIZATION, (Continued)		Students will:	Given the proper instruction, the student should be able to
use standard hook-up wire to connect the modules together.		-interpret the "answers" obtained by translating the "answer" into a base 10 number.	properly interpret the "answers" obtained in such operations.
insert and remove the plug-in modules from the ECT circuit.		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete the objectives for vocational applied General Math III.
LAB SAFETY	Students will:		
Time allotment: Day 136			
Given the proper instruction, the student should be able to:			
exercise necessary safety precautions in the laboratory.			
practice emergency drill procedures.			
list safety rules for classroom/lab.	-list safety rules for classroom/lab.		
list potential safety hazards in the classroom/lab.	-list potential safety hazards in the classroom/lab.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
LAB SAFETY, (Continued) list three reasons for preventive maintenance. state the proper procedure in event electric shock occurs. demonstrate proper use of equipment protection devices. demonstrate the proper procedure in event electric shock occurs.	Students will: -list three reasons for preventive maintenance. -state the proper procedure in event electric shock occurs.	Students will: Note: The activities and objectives from the previous page are continued.	Given the proper instruction, the student should be able to
INTRODUCTION TO DIGITAL LOGIC, Time Allotment: Day 137 Given the proper instruction, the student should be able to: relate some of the history of logic and tell how those ideas apply to digital systems.	Students will: -read Module C in Student Manual. -relate some of the history of logic and tell how those ideas apply to digital systems.	Note: The activities and objectives from the previous page are continued.	

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INTRODUCTION TO DIGITAL LOGIC, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
relate the concept of binary systems in which there are two states of operation.	-relate the concept of binary systems in which there are two states of operation.		
demonstrate the way digital systems work.			
demonstrate the way analog systems work.		Note: The activities and objectives from the previous page are continued.	
identify some aspects of integrated circuit construction.			
state the way integrated circuits have revolutionized digital circuitry.	-state the way integrated circuits have revolutionized digital circuitry.		
state the basic principles of AND gates, OR gates.	-state the basic principles of AND gates, OR gates.		

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BINARY NUMBER SYSTEMS AND CODES Time Allotment: Days 138-139 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
	-read and discuss Module D in Student Manual.	-identify the symbols to be used in the Binary Number System.	define the binary number system.
state the basis for different numbering systems.	-state the basis for different numbering systems.	-write a place value table for the binary number system.	understand place values in the binary number system.
state the meaning of positional numbering system.	-state the meaning of positional numbering system.	-practice converting decimal numbers to binary numbers.	convert decimal (base 10) numbers to binary numbers.
use the relative weights of the digits of a number in the binary and decimal numbering systems.		-practice converting binary numbers to decimal numbers.	convert binary numbers to decimal numbers.
		-practice adding binary numbers.	add binary numbers:
		-practice subtracting binary numbers.	subtract binary numbers.
identify and interpret the decimal numbering system.	-identify and interpret the decimal numbering system.	-practice multiplying binary numbers.	multiply binary numbers.
		-practice dividing binary numbers	divide binary numbers.
identify and interpret the binary numbering system.	-identify and interpret the binary numbering system.	-check the results of various operations in the binary system by converting components and answers into base 10 numbers.	define binary coded decimals (BCD).
convert a decimal number to a binary number.			convert decimal numbers to BCD.
convert a binary number to a decimal number.		-discuss binary coded decimals (BCD) (cont.)	convert BCD to decimal numbers. (cont.)

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BINARY NUMBER SYSTEMS AND CODES, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
convert decimal numbers to BCD and BCD to decimal numbers.		-practice converting BCD into decimal numbers.	Note: Students will complete objectives for vocational applied General Math III.
convert binary numbers to the Gray code and Gray code to binary numbers.		-practice converting decimal numbers into BCD.	
convert binary numbers to the excess-3 code and the excess-3 code to binary numbers.		Note: Academic and vocational teachers will coordinate activities.	
BINARY ARITHMETIC AND NUMBERING SYSTEMS	Students will:	Students will:	Given the proper instruction, the student should be able to:
Time Allotment: Days 140-143			
Given the proper instruction, the student should be able to:			
add binary numbers.	-read Module E in Student	-identify the symbols to be used in the octal number system.	define the octal number system.
subtract binary numbers.		-write a place value table for the octal number system.	understand place values in the octal number system.
multiply binary numbers.		-practice converting decimal numbers to octal numbers.	convert decimal numbers to octal numbers.
divide binary numbers.		(cont.)	(cont.)

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BINARY ARITHMETIC AND NUMBERING SYSTEMS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
convert decimal numbers to octal numbers.	-complete experiment to Module E.	-practice converting octal numbers to decimal numbers.	convert octal numbers to decimal numbers.
convert octal numbers to binary numbers.		-practice converting binary numbers to octal numbers.	convert binary numbers to octal numbers.
convert decimal numbers to hexadecimal numbers.		-practice converting octal numbers to binary numbers.	convert octal numbers to binary numbers.
convert hexadecimal numbers to binary numbers.		-identify the symbols to be used in the hexadecimal number system including the "new" symbols which must be introduced.	define the hexadecimal number system.
use the complement of a number.		-write a place value table for the hexadecimal number system.	understand the "new" symbols which must be introduced to interpret and use the hexadecimal number system.
use any other numbering system.		-practice converting decimal numbers to hexadecimal numbers.	convert decimal numbers to hexadecimal numbers.
		-practice converting hexadecimal numbers to decimal numbers.	convert hexadecimal numbers to decimal numbers.
		-practice converting binary numbers to hexadecimal numbers.	convert binary numbers to hexadecimal numbers.
		-practice converting hexadecimal numbers to binary numbers.	convert hexadecimal numbers to binary numbers.
		Note: Academic and vocational teachers will coordinate activities.	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
LOGIC FAMILIES AND BASIC GATES Time Allotment: Days 144-145 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
:se TTL logic devices.	-read Module F in Student Manual.	-discuss the derivation of the zero and negative exponents.	define the zero exponent.
.se CMOS logic devices.	-discuss logic devices.	-practice re-writing expressions involving negative exponents using only positive exponents.	understand that any number to the zero power is "one."
interface TTL and CMOS cir-:uitry.	-discuss TTL and CMOS cir-cuitry.	-work various electronics problems involving the use of negative exponents.	define "reciprocal."
:ook up and troubleshoot AND 'ircuitry.	-discuss TTL and CMOS cir-cuitry.	Note: Academic and vocational teachers will coordinate activities.	define negative exponents.
.ook up and troubleshoot OR :ircuitry.			rewrite expressions involving negative exponents using only positive exponents.
:se the STROBE operation.	-discuss STROBE operation.		Note: Students will complete objectives for vocational applied General Math III.
hart logic truth tables.	-chart logic truth tables.		
	-read timing and wiring diagrams.		

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
COMBINATION GATES Time Allotment: Days 146-147 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
apply the NOT function for construction of combinational.	-read and discuss Module 6 in Student Manual.	-discuss the need for and uses of scientific notation.	define scientific notation.
use the NAND gate to substitute for the NOT-AND circuit.	-chart the truth table for the NOT function; NAND gate; NOR gate; EXCLUSIVE-OR gate, and the EXCLUSIVE-NOR gate.	-rename the positions in the place valve table using 10 with the proper positive, negative or zero exponent.	understand the uses of scientific notation. rename place valves using powers of ten (positive, negative and zero exponents.)
apply the EXCLUSIVE-NOR gate in a combinational gating circuit.	-discuss and explain the functions of the NOT and the AND gates.	-practice translating numbers in standard notation into scientific notation.	rewrite "large" numbers using scientific notation.
use the NOT gate to perform the operation of the AND gate.		-practice translating numbers written in scientific notation into standard notation.	rewrite "small" numbers using scientific notation.
		-make a list of numbers pertinent to electronics using both standard and scientific notation (e.g. the 6.24×10^{18} represents a charge of 6.24×10^{18} electrons. In standard notation this number would be written 6,240,000,000,000,000,000).	rewrite numbers written in scientific notation, using standard notation. Note: Students will complete objectives for vocational applied General Math III.

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CIRCUIT MINIMIZATION TECHNIQUES Time Allotment: Days 148-149 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
use Boolean algebra to add substract, multiply, and divide binary computations.	-read and discuss Module H.	-calculate the probabilities associated with "games of chance" (e.g. probabilities of certain numbers "coming up" when throwing a pair of dice).	understand the theory of probability.
use Boolean algebra to simplify digital logic circuits.	-read and complete worksheet on Boolean Algebra.	-work various problems using Boolean Algebra as relavent to the electronics teacher's objectives.	calculate the probability that a specific outcome will result after having been given required information.
apply the tautologies and the identities of Boolean algebra as a logic simplification technique.		Film: Probability (#691)	
utilize the Karnaugh mapping technique as a method for minimizing digital electronic circuits.		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete objectives for vocational applied General Math III.
draw Karnaugh maps for Boolean expression.	-draw Karnaugh maps for Boolean expression.		
apply the data select process for minimizing digital logic circuit complexity.			

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CIRCUIT MINIMIZATION TECHNIQUES, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
design a data select circuit.	-design a data select circuit.		
state when to apply Boolean algebra in place of conventional algebra.	-state when to apply Boolean algebra in place of conventional algebra.	Note: The activities and objectives from the previous page are continued.	
use binary numbers as related to Boolean algebra.			
BUFFERS, INVERTERS, AND THREE-STATE LOGIC	Students will:		
Time Allotment: Days 150-154			
Given the proper instruction, the student should be able to:		Students will:	Given the proper instruction, the student should be able to:
use buffers and inverting buffers in conjunction with gating circuits.	-read and discuss Module I: buffers, inverters, and three-state logic.	-discuss general and mathematical uses of sets.	define a "set."
determine the characteristic fan-out for buffers and for inverters.	-complete all experiments on Module I and explain procedures and results.	-discuss whether a set (non-mathematical) is "well defined" (use electronics "sets").	use proper set notation.
		-discuss and give examples of "complete" listing of sets.	define the elements (members) of a set.
		-discuss and give examples of the "empty set."	define the "empty set."
		(cont.)	define and use "complete" or "partial" listing of sets.
			define and use "set builder notation."
			(cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BUFFERS, INVERTERS, AND THREE-STATE LOGIC, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
determine the propagation delay factors for buffers and inverters.		-discuss and give examples of "partial" listing of sets.	identify sets as either "finite" or "infinite."
apply the principles of three-state buffering as typically used in bus-organized systems.		-discuss and give examples of "set builder notation."	identify "equal" and "equivalent" sets.
chart a truth table for three-input NAND gate.	-chart a truth table for three-input NAND gate.	-write a set using a complete listing, a partial listing and set builder notation after having been given a verbal description of a mathematical set of integers.	define "subset."
		-discuss and give examples of infinite sets.	identify and list various (or all) subsets of a given set.
		-identify a specific set as finite or infinite.	define the "union" of two sets.
		-discuss and give examples of equal sets.	define the "intersection" of two sets.
		-discuss and give examples of equivalent sets.	determine the "union" or "intersection" of any two sets.
		-tell if two sets are equal, equivalent, both, or neither.	Note: Students will complete the objectives for vocational applied General Math III.
		-list all subsets of a given set.	
		-identify statements describing one set as a subset of another as "true" or "false."	
		-identify and list (in set form) the "union" of two given sets.	
		(cont.)	

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BUFFERS, INVERTERS, AND THREE-STATE LOGIC (Cont.)		-identify and list (in set form) the "intersection" of two given sets. Note: Academic and vocational teachers will coordinate activities.	

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
LATCHES, FLIP-FLOPS AND BASIC MEMORIES	Students will:	Students will:	Given the proper instruction, the student should be able to:
Time Allotment: Days 155-159			
Given the proper instruction, the student should be able to:		-use electronics drawings to note the occurence and use of intersecting lines, parallel lines and perpendicular lines.	define intersecting lines.
			define parallel lines.
apply the main function of latches to digital electronic systems.	-read and discuss Module J: latches, flip-flops and basic memories.		define perpendicular lines.
		-construct a perpendicular to a line using a compass.	construct perpendicular lines.
apply the main functions of elementary flip-flops to digital electronic systems.		-discuss and define vectors.	define vectors.
		-practice finding the resultant of any two vectors graphically.	find the "resultant" of any two vectors graphically.
construct and apply digital circuits using D-type flip-flops.		-practice finding the resultant of two vectors at 90° by using the Pythagorean Theorem.	find the "resultant" of two vectors at 90° mathematically.
construct and apply digital circuits using T-type flip-flops.		-work various electronics problems (AC voltage) to find the impedance in an RCL circuit.	
construct and apply digital circuits using R-S type flip-flops.		Film: Electric Fields (#451)	
apply the aspects of a synchronous latch.		Note: Academic and vocational teachers will coordinate activities.	Note: Students will complete objectives for vocational applied General Math III.
apply the aspects of an asynchronous latch.			
chart the operation of a J-K flip-flop.	-chart the operation of a J-K flip-flop.		
use the J-K master-slave flip-flop.			

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ENCODERS AND DECODERS Time Allotment: Days 160-164 Given the proper instruction, the student should be able to: decode common number bases from binary information using digital electronic components. reassemble common number bases from binary information using digital electronic components. assemble and use a 2-to-4 line decoder. assemble and use a binary-to-hexadecimal decoder. assemble and use an illegal BCD detector. assemble and use a BCD-to-7 segment display. convert digital electronic circuits from a common number base of language into a binary format.	Students will: -read and discuss Model K, encoders and decoders.	Students will: -discuss initial use of and need for computers. -visit the computer lab. -identify and discuss uses of computers in various fields. -identify and discuss uses of computers in electronics. -discuss "jobs" that computers are capable/incapable of performing. Use electronics situations. -describe possible "computer errors" and innocent "victims." -list known misuses of computers (swindling, invasion of privacy selling of mailing lists, etc.) -discuss cost versus savings. -discuss advantages/disadvantages of computer usage. -describe the five parts of a computer and their functions. -get "hands on" experience with a computer in the classroom (if available) or in the computer lab. (cont.)	Given the proper instruction, the student should be able to demonstrate an understanding of the historical development of computers. demonstrate understanding of the widespread applications and implications of computers in today's society. identify some of the limitations and disadvantages, as well as the many advantages, of computer usage. identify the components of a computer and their functions.

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ENCODERS AND DECODERS, (Continued)		Students will:	Given the proper instruction, the student should be able to
use digital gates for enclosing and for multiplexing.		Note: Academic and vocational teachers will coordinate activities.	
CLOCKS AND SIGNAL CONDITIONERS	Students will:		
Time Allotment: Days 165-169			
Given the proper instruction, the student should be able to:			
apply the principles of clocking circuits to digital electronics.	-read and discuss Module L.	-discuss the types and "levels" of mathematics required for a successful career in electronics.	understand the mathematical needs related to a career in electronics.
determine fan-out of a clock circuit.		-make a "list of the mathematical skills required for success in a specific electronics occupation (TV repairman, computer technician, etc.). Preferably, the occupation chosen will be one that the student is considering as his career goal.	look for a pattern.
wire a clock circuit.			construct a table.
determine stability for a clock circuit.	-explain the principles of clocking circuits.		consider possibilities systematically.
			make a model.
			guess and check.
			work backwards.
		(cont.)	(cont.)

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CLOCKS AND SIGNAL CONDITIONERS, (Continued	Students will:	Students will:	Given the proper instruction, the student should be able to:
determine fan-out of a clock circuit.		-discuss which of these techniques will be useful in electronics problems and situations.	make a drawing, figure, or graph.
determine accuracy of a clock circuit.		-practice these techniques by working various problems pertinent to electronics.	select appropriate notation.
use the non-stable multivibrator in digital circuit applications.	-explain and draw a non-stable multivibrator circuit.		restate the problem.
wire a non-stable multivibrator circuit.		Note: Academic and vocational teachers will coordinate activities.	identify wanted, given, and needed information.
apply the Schmitt trigger as a conditioner of a non-digital signal.			write an open sentence.
wire a standard TTL Schmitt trigger circuit.	-explain the function of a Schmitt trigger.		identify a subgoal.
			solve a simpler problem.
			change a point of view.
			check for hidden assumptions.
			use a resource.
			generalize.
			check the solution.
			study the solution process.
			Note: Students will complete the objectives for vocational applied General Math III.

APPLIED MATHEMATICS: BASIC ELECTRONICS I

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
COUNTERS Time Allotment: Days 170-174 Given the proper instruction, the student should be able to:	Students will:	Students will:	Given the proper instruction, the student should be able to
apply the operation of asynchronous counters to digital electronics.	-explain asynchronous and synchronous counters to digital electronics.	-work various word problems pertinent to electronics.	read the problems carefully. identify information given and information sought.
apply the operation of synchronous counters to digital electronics.		Note: Academic and vocational teachers will coordinate activities.	identify relevant information and discard irrelevant information. verbalize the problem.
apply the operations of a mod-2 ripple counter to digital electronics.	-discuss mod-2 and decade ripple counter IC.		estimate the answer. find the exact answer. check.
apply the operations of a decade ripple counter IC to digital electronics.			
apply the operations of the 7419 IC as a decade counter.	-discuss the 7419IC.		Note: Students will complete the objectives for vocational applied General Math III.
apply the operation of a 74190 IC as a decade-up counter.			

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
COUNTERS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
apply the operations of the 74100 IC as a decade-down counter.			
program the 74190 synchronous up counter.	discuss and explain the 74190 synchronous up and down counter.	Note: The activities and objectives from the previous page are continued.	
program the 74190 synchronous down counter.			
program the 7419 IC synchronous up/down counter.			
SHIFT REGISTERS	Students will:		
Time Allotment: 175-180			
Given the proper instruction, the student should be able to:			
use shift registers for data storage and data manipulation.	-read and discuss Module N in the Student Manual.	-review mathematical topics and techniques covered earlier in the year by working various word problems pertinent to those topics and to electronics.	Note: The objectives from the previous page are continued.
parallel load and series load a shift register.	-define and discuss shift registers.		
		Note: Academic and vocational teachers will coordinate activities.	

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SHIFT REGISTERS, (Continued)	Students will:	Students will:	Given the proper instruction, the student should be able to
construct, use a ring counter and a Johnson counter.	-define and discuss ring counter, Johnson Counter.		
wire and use the 7495 4-bit shift register.	-explain the use and operation of the 7495 4-bit shift register.		
demonsrate the operation of a shift register.			

APPLIED ACADEMICS

MATHEMATICS

THE APPLIED MATHEMATICS OBJECTIVES AND ACTIVITIES FOR EACH VOCATIONAL CONTENT AREA ARE TO BE INTEGRATED INTO THE GRADED COURSE OF STUDY AND THE CURRICULUM BULLETINS ADOPTED BY THE CINCINNATI PUBLIC SCHOOLS.

APPLIED ACADEMICS

MATHEMATICS

PROGRAM PHILOSOPHY

Mathematics is a growing body of information and a set of processes. It originates in the world of reality, is abstracted, and formalized into a logical system of facts, concepts, and rules. It is used to describe the quantitative and spatial aspects of the world, and as a tool in problem solving, scientific investigation, and technological development. All people use mathematics to some extent in their daily lives.

The Applied Academics Mathematics Program in the Cincinnati Public Schools is designed to enable all pupils to learn mathematics and achieve skill with its use in order to reach their full potential and to cope with the quantitative and spatial aspects of their environment.

Mathematics is to be taught so that pupil self-image is enhanced and good attitudes toward mathematics are developed. Instructional strategies and content are to be selected in accordance with knowledge of child development and learning theory. Manipulative materials, readiness activities, instruction aids, and realistic applications related to the vocational content are used. Ideally, mathematics will be viewed by the learner as a meaningful activity having many applications and not merely as a mental discipline. All areas of mathematics are more easily grasped when they are applied to practical daily and vocational applications in problem solving.

The goals in this program include more than computation. Daily use of such skills as estimating, problem solving, interpreting data, organizing, measuring, and especially applying mathematics to vocational situations is essential if students are to master the basic mathematical competencies needed for daily living and on the job.

APPLIED ACADEMICS

MATHEMATICS

PROGRAM GOALS

The goals of the Applied Academics - Mathematics Program of the Cincinnati Public Schools are to provide each student with the opportunity to master the following skills.

As related to an identified vocational area, the student should be able to:

A. acquire basic skills in obtaining information, solving problems, thinking logically, critically, and communicating effectively

B. acquire the knowledge, skills, and understanding that permit him/her to play satisfying and responsible roles as both producer and consumer

C. acquire job entry-level skills and, also, to acquire knowledge necessary for further education

D. develop a positive self image, abilities and potentialities

APPLIED MATHEMATICS

ALGEBRA I

PROGRAM OBJECTIVES

I. Real Numbers

A. The program provides opportunities to simplify and evaluate numerical expressions

B. The program provides opportunities to compare real numbers on a number line

C. The program provides opportunities to add, subtract, multiply, and divide real numbers

II. Equations

A. The program provides opportunities to use several transformations to solve equations

B. The program provides opportunities to use problem-solving strategies to solve problems involving cost and value

III. Polynomials

A. The program provides opportunities to add, subtract, multiply, and divide polynomials

B. The program provides opportunities to transform formulas

C. The program provides opportunities to use problem-solving strategies to solve distance and area problems

D. The program provides opportunities to find the product of two binomials mentally

E. The program provides opportunities to find the factors of a simple polynomial

IV. Rational Expressions

A. The program provides opportunities to simplify, add, subtract, multiply, and divide algebraic fractions

B. The program provides opportunities to use ratio and proportion

C. The program provides opportunities to solve fractional equations

D. The program provides opportunities to use problem-solving strategies to solve percent, mixture, and work problems

E. The program provides opportunities to use negative exponents

V. Linear Equations and Functions

A. The program provides opportunities to graph ordered pairs and linear equations in two variables

B. The program provides opportunities to solve systems of linear equations

C. The program provides opportunities to use problem-solving strategies to solve, wind, water current, digit, age, and fraction problems

D. The program provides opportunities to graph linear and quadratic functions

E. The program provides opportunities to use variation

VI. Inequalities

A. The program provides opportunities to solve and graph inequalities in one variable

B. The program provides opportunities to use problem-solving strategies to solve problems involving inequalities

C. The program provides opportunities to graph linear inequalities in two variables

VII. Using Radical Expressions

A. The program provides opportunities to find decimal approximations to irrational square roots

B. The program provides opportunities to simplify, add, subtract, multiply, and divide radical expressions

C. The program provides opportunities to use the Pythagorean Theorem

D. The program provides opportunities to solve radical equations

E. The program provides opportunities to solve quadratic equations

APPLIED MATHEMATICS

SUBJECT OBJECTIVES

A. Real Numbers

The student will:

1. use order of operations to simplify numerical expressions which involve indicated arithmetic operations, powers, or grouping symbols
2. change word descriptions to mathematical expressions and equations
3. define integer, rational number, and real number and discuss the properties of the real numbers
4. use opposites and absolute value
5. show the order of real numbers
6. use the addition, multiplication, and equality axioms to simplify expressions
7. add, subtract, multiply and divide real numbers

B. Equations

The student will:

1. solve equations using addition or subtraction
2. solve equations using multiplication or division
3. use several transformations to solve equations
4. use charts to arrange facts in problems
5. solve problems involving cost and value

C. Polynomials

The student will:

1. simplify exponential expressions
2. identify algebraic expressions as monomials, binomials, trinomials, or polynomials

3. determine the degree of the polynomial
4. find powers of a monomial
5. transform formulas
6. solve problems involving uniform motion
7. solve problems involving area
8. factor integers
9. find a monomial factor of a polynomial
10. find the product of two binomials mentally
11. find the factors of a simple polynomial
12. use factoring to solve polynomial equations

D. Rational Expressions

The student will:

1. simplify algebraic expressions
2. fund the product and quotient of two algebraic expressions
3. express algebraic fractions with their common denominators
4. find the sum and difference of two algebraic expressions
5. use ratios and proportions to solve problems
6. solve equations with fractional coefficients
7. solve problems involving percents
8. solve mixture problems
9. solve work problems
10. use scientific notation
11. use negative exponents

E. Linear Equations and Functions

The student will:

1. solve linear equations in two variables given specific replacement sets
2. graph orderedpairs and linear equations in two variables
3. determine the solution set of a system of two linear equations by graphing, linear combination, or substitution
4. use systems of equations to solve wind, water current, digit, age, and fraction problems
5. find the slope and y-intercept of a line
6. find the equation of a line given its slope and y-intercept, its slope and a point on the line, or two points on the line
7. use function notation
8. graph linear and quadratic functions
9. use direct, inverse, joint, and combined variation to solve problems

F. Inequalities

The student will:

1. solve and graph inequalities in one variable
2. solve problems that involve inequalities
3. graph linear inequalities in two variables

G. Using Radical Expressions

The student will:

1. express rational numbers as decimals or fractions
2. simplify rational square roots
3. find decimal approximations to irrational square roots
4. simplify radical expressions
5. use the Pythagorean Theorem
6. add, subtract, multiply, and divide radical expressions
7. solve equations involving radical expressions
8. solve quadratic equations with real roots by factoring, by completing the square, or by use of the quadratic formula

APPLIED ACADEMICS

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12TH GRADE CURRICULUM

The following instructional activities are divided by grade level and are intended to assist you in teaching the objectives in the graded course of study. As supplements to the activities, instructional information is given in the introduction, philosophy and goals sections at the beginning.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ORIENTATION Time Allotment: 1-5 Days			(DIAGNOSTIC EVALUATION)
Given the proper instruction the student should be able to: define and demonstrate understanding of school and classroom/lab rules, basic practices and procedures.	Students will:	Students will:	Given the proper instruction the student should be able to:
display safe and proper conduct in the classroom/lab.	- read and discuss school-classroom/lab rules, basic practices and procedures.	- take Estes attitude scale.	indicate his feelings about self, school in general, and subject.
display proper understanding of safety/fire equipment; location, application and use.	- tour lab and "role play" appropriate behavior of safe and proper conduct.	- respond to teacher-devised scale dealing with attitude regarding subject area and school in general.	participate in discussion as an outcome of the scales and inventory completed.
complete necessary forms for collection of personal/ emergency data.	- practice using safety/fire equipment.		
prepare goal statement; relate in own words what is hoped to be achieved as a result of completion of this training. Student shall state his/her objectives in school and in future occupation.	- practice emergency evacuation/drill procedures. - practice filling out forms for personal and emergency information.	- take Cloze Test.	take Cloze Test to assess suitability of textbook.

Continued

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DEVELOPING INTERPERSONAL/ EMPLOYABILITY SKILLS Time Allotment: Days - 1-5			
Given the proper instruction the student should be able to: develop and practice employability/leadership skills to gain and maintain employment successfully.	Students will: - manage the shop. - learn shop procedures - interact with supervisors, instructors, and co-workers/classmates. - participate in VICA leadership activities. - take pre-tests on experience, past/present. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - read and discuss the school rules and class rules. - coordinate acativities with electronics teacher. - practice fire, tornado and emergency drills. - explain the correlation between the mathematics class and the electronics class. - explain classroom procedures, grading, exams and general expectations. - take diagnostic testing to determine a student's approximate grade level and remediation needs. - complete personal data sheet including a statement of goals for the future.	Given the proper instruction the student should be able to: exhibit an understanding of school rules. list and interpret class rules. know the emergency drill routes for both fire and tornado. understand the need for mathematics in order to work out problems in electronics. know what is expected in order to earn a good grade. confer with the teacher as to taking the test to determine his individual needs for remediation. answer 10 assigned problems on each of the different topics.(solve at least 7 of them correctly).

APPLIED MATHEMATICS: COMMUNICATION ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
		Students will: - work various problems where addition, subtraction, multiplication and division are used in the same problems, to discover the correct order for these operations. - substitute given number values for literal numbers. - simplify to find the numerical value of the given expression. - define integer, rational number, real number and discuss the properties of the real numbers. - compare real numbers. (Ref. Algebra, Structure and Method) Dolciani pp. 30-33 pp. 37-39	Given the proper instruction the student should be able to: graph real numbers on a number line. use > and < to show the order of numbers.

APPLIED MATHEMATICS: COMMUNICATION ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INTRODUCTION TO ELECTRONICS SENIOR REVIEW ELECTRICAL SCIENCE Time Allotment: Days 6-7 Given the proper instruction the student should be able to: define the basic structure of matter and its relationship to electricity. explain electrical charges. demonstrate, in the laboratory, applications of electromatism. complete magnetism lab exercises.	Students will: - draw a diagram of a basic atom and correctly label the components thereof. - define the basic structure of matter. - define positive and negative ions. - name at least five sources of electricity. - demonstrate laws of charges using magnets and iron filings. - construct a basic series circuit using material in the student trainer.	Students will: - apply the number line to show the relationship between negative and opposite, the positon of zero on the scale. - use the numbers line to explain absolute value. - develop rules for addition of signed numbers.	Given the proper instruction the student should be able to: understand and use signed numbers in arithmetic operations, problems involving positive and negative ions. understand the meaning of absolute value as it applies to the rules for addition of signed numbers.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CONDUCTORS - SEMICONDUCTORS - INSULATORS Time Allotment: Days 8-9 Given the proper instruction the student should be able to: explain conductor properties. explain insulator properties. define and demonstrate semi-conductors and their characteristics. define N-type and P-type semi-conductors and their use. perform semi-conductor experiements.	Students will: - name five good conductive materials and show examples of each. - name five good insulative materials and show examples of each. - define intrinsic conductor and its use. - define resistance and demonstrate its use in a circuit. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - develop rules for multiplication of signed numbers. - discover the relationship between multiplication and division. - practice multiplication and division of signed numbers. - identify and use the addition, multiplication, and equality axioms to simplify expressions. (Ref. Algebra Structure and Method, Dolciani, pp.45-48	Given the proper instruction the student should be able to: multiply and divide signed numers. solve problems involving signed numbers and all types of arithmetic operations. use number properties to simplify expressions.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RESISTIVE CIRCUITS Time Allotment: Days 10-14			
Given the proper instruction the student should be able to: perform calculations using Ohms Law. define the basic units of electrical measurement. perform calculations using Kirchoff's Law. explain what energy is. explain power and heat dissipation using Ohms and Kirchoff's Laws, Watt's Law.	Students will: - coordinate with academic teacher. - state Ohms Law three ways. - demonstrate, in the lab, the units of measurement for voltage, current, resistance, and power. - state Kirchoff's Law and draw a circuit using the law for your calculations. - demonstrate and define energy, work to be done, rate of work being done. - construct a simple circuit and solve problems relative to it using voltage, current, resistance and power laws. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - explain and give examples of multiplication of powers and the power of a product. - make a chart of powers and roots.* - solve problems by using Ohms Law to find voltage, current, resistance or power. P=IxE $I=\frac{P}{E}$ $E=\frac{P}{I}$ - use Kirchoff's Law to solve problems about series circuits. ER1,+ ER2 + ER3=E Source *Films: Big Numbers: Little Numbers #389 Powers of Ten # 3626	Given the proper instruction the student should be able to: understand and use the properties of exponents. understand and perform square roots. substitute numbers for variables in a formula such as Ohm's Law and solve for the unknown. use Kirchoff's Law to solve problems about series circuits.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Students Objectives
MAGNETISM Time Allotment: Day 15 Given the proper instruction the student should be able to: demonstrate the principles of magnetism. demonstrate, in the laboratory, the Law of Magnetic Force. identify specific differences between temporary and permanent magnets. explain the characteristics of electromagnetism.	Students will: - define and discuss in depth, the nature and properties of magnetic fields. - show how the Law of Magnetic Force works by using barr and horseshoe magnets. - us the blackboard to state the factors determining field strength. - construct a circuit to demonstrate temporary magnetism. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - demonstrate the following properties of equations: - addition subtraction multiplication division - solve at least three equations using each property separately. - solve ten equations with combinations of properties. - solve Rowland's Law for F or R $= \frac{F}{R}$ (Roland's Law)	Given the proper instruction the student should be able to: solve linear equations. solve formulae for any one of the variables that are not given.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
GENERATORS Time Allotment: Days 16-19 Given the proper instruction the student should be able to: demonstrate and explain that the alternator is really an AC generator. explain that for large power requirements the alternator usually has a rotor field. define/demonstrate knowledge of correct terminology, calculate values of AC voltages. define the principles of single and multi-phase generators.	Students will: - define A-C voltage generation and A-C current. - demonstrate in the class/laboratory the "Left Hand Rule" of electron flow. - construct in the laboratory a circuit to demonstrate the induced field around a moving conductor and how it is opposed by the existing field according to Lenz's Law. - Solve math problems relative to Lenz's Law. - draw diagrams of: - alternator - single-phase generator - multi-phase generator - A-C generator NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - demonstrate methods of simplifying an improper fraction. - practice simplifying improper fractions, changing them to a whole number or a mixed number. - explain methods of solving linear equations involving fractions. - study the components of Lenz's Law and solve problems using this law. - solve linear equations involving fractions. - solve math problems relative to Lenz's Law. - solve problems using information from real life situations and make a realistic interpretation of the answer. (Ref. Algebra structure and Method Dolciani pp. 97-124	Given the proper instruction the student should be able to: simplify fractions. use problem-solving strategies. solve different word problems.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student activities	Academic Student Activities	Academic Student Objectives
METERS AND MOVEMENTS **Time Allotment: Days 20-24** Given the proper instruction the student should be able to: know and explain the operation of meter movement. explain, demonstrate bridge circuits and determine the effects of circuit loading. use the ohmmeter to measure various resistor ohmic values. explain that multiplier resistors are used to increase the voltage range of the voltmeter. use the oscilloscope to measure peak-to-peak voltages.	Students will: - define basic meter movements. - construct a circuit using laboratory components to demonstrate the proper use of a volt meter to measure A-C and D-C voltages. - demonstrate the proper use of an ohmmeter using laboratory components to measure at least ten different values of resistance. - demonstrate the proper use of the oscilloscope to measure A-C voltages. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - explain two division problems and show how to place the decimal when a whole number is divided by a decimal. - explain rounding of decimals. - draw a right triangle and label the angles and sides. - define sine, cosine and tangent. - solve problems to find each of the above. - practice using the table to find the angle for any given sine, cosine or tangent. - solve alternating current problems. (Ref. Gerrish & Dugger pp. 110)	Given the proper instruction the student should be able to: divide a whole number by a decimal and round off the answer. state the sine, cosine or tangent of an angle in terms of the sides of the triangle. find the angle on the table for any sine, cosine or tangent. solve alternating current problems.

APPLIED MATHEMATICS: COMMUNICATION ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
INDUCTANCE Time Allotment: Days 25-31 Given the proper instruction the student should be able to: identify relationships and calculate values between inductance frequency, and resistance. calculate impedance, resonance and phase angle. add both graphically and mathematically out-of-phase voltages and currents. state the basic characteristics of RL circuits.	Students will: - draw a schematic diagram of a inductance circuit and explain its operation. - draw a schematic diagram of a mutual inductance circuit and explain its operation. - construct a circuit to demonstrate, in the lab, how to measure resistance. - construct a circuit to demonstrate, in the lab, how to measure impedance. - construct an RL circuit using a coil and transformer. - solve math problems relative to inductance, RL circuits and impedance. NOTE: Vocational and Academic teachers will coordinate activities	Students will: - write the ratio between the number of primary and secondary turns to compare output and input voltage. - use cross products to find the secondary voltage when given applied voltage, primary and secondary turns in a transformer. - read frequency and inductance graphs. - calculate values between inductory frequency and resistance. - construct graphs, showing these. (Ref. Gerrish & Dugger p. 126)	Given the proper instruction the student should be able to: write the ratio of two quantities. use cross products to solve two equal ratios (proportions). read and interpret line graphs. construct line graphs. use formulae to find impedance resonance and phase angle.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
CAPACITANCE Time Allotment: Days 32-36 Given the proper instruction the student should be able to: explain that capacitance is the ability of a dielectric to store an electric charge. determine, in the lab, the time necessary to charge a capacitor. give the unit of measurement for the capacitor. explain the amount of "Q" stored in a capacitor and its relationship to the applied voltage. give the three formulae for the power factor of a capacitor.	Students will: - construct a series capacitance circuit and explain its operation. - construct a parallel capacitance circuit and explain its operation. - demonstrate the proper use of a capacitor checker using lab components. - solve math problems relative to: series and parallel capacitance. power factors. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - review examples of the four fundamental operations with fractions and mixed numbers. - practice the fundamental operations with fractions and mixed numbers. - study the steps involved in solving a complex fraction where two or more capacitors are connected in series. - substitute numbers into the formula and solve a problem with complex fractions. - substitute numbers into all three formulae for the power factor of a capacitor and solve.	Given the proper instruction the student should be able to: add two or more fractions and mixed numbers. find the difference between two fractions or mixed numbers. find the product of two fractions or mixed numbers. find the quotient of two fractions or mixed numbers. simplify a complex fraction. substitute values into a formula and solve the problem. raise to a power or find the square root of a number.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RCL - CIRCUITS Time Allotment: Days 37-40 Given the proper instruction the student should be able to: explain what the characteristics of a series-resonant circuit are. calculate impedance, resonance and recall that the quality of the resonant circuit is indicated by the factor "Q". state the characteristics of basic filter circuits.	Students will: - construct a resonance circuit and explain its operation. - calculate the effect of "Q" on a bandwidth circuit constructed in the laboratory. - solve math problems to calculate resonant frequencies. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - review the properties used in solving linear equations. - discuss literal equations. - demonstrate the methods used to solve one of the variables in terms of the others. - explain the properties of negative exponents. - practice using the properties of negative exponents. - solve an equation with radicals and explain each step. - practice using radical equations to find resonant frequencies.	Given the proper instruction the student should be able to: solve literal equations such as $2\pi fl = \frac{1}{2\pi fc}$ for f. use the properties of negative exponents. solve equations with radicals such as $fo = \frac{159}{\sqrt{LC}}$ calculate resonant frequencies.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
A-C & DC MOTORS **END OF REVIEW** **Time Allotment: Days 41-45** Given the proper instruction the student should be able to: understand the theory and principles of operation of the D-C motor. use it in a circuit. understand the theory and principles of operation of the A-C motor. use it in a circuit.	Students will: - wire a D-C motor in a circuit. - wire an A-C motor in a circuit. - draw diagrams and explain theory of operation of D-C motors, A-C motors. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - work percent problems pertaining to motors. - use the percent speed regulation formula to solve problems. (Percent Speed Regulation = $\frac{\text{Speed no-load}}{\text{Speed full-load}}$ x 100) - define equal sets, finite and infinite sets, the empty set. - find the intersection and union of two sets.	Given the proper instruction the student should be able to: find a percent of a number. - find the percent speed regulation of a motor. - understand sets. - find the intersection and union of sets.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Objectives	Academic Student Activities	Academic Student Objectives
SOLID STATE FUNDAMENTALS Time Allotment: Days 46-49 Given the proper instruction the student should be able to: explain the principles of solid state electronics and its use in new technology. know the construction of diodes and that the diode is the basic semi-conductor of the family of semi-conductors.	Students will: - construct a circuit using a p/n junction diode. - construct a circuit using an n/p/n transistor. - draw circuit diagrams to illustrate the circuits constructed.(above) NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - use additive inverse to get variables on one side of the equation and constants on the other. - apply the multiplication/division property. - apply the distributive property to remove parentheses, then apply above methods to solve. - compute d c resistance of a diode from the volt-ampere curves by using the formula $R_{dc} = \frac{V}{I}$.	Given proper instruction the student should be able to: solve linear equations with variables on both sides. solve linear equations with enclosures; i.e., parentheses. compute d c resistance of a diode.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
RECTIFICATION Time Allotment: Days 50-54 Given the proper instruction the student should be able to: know conversion of AC into DC by construction of half-wave, full-wave and bridge rectifier circuits. explain the operation of a full-wave rectifier and its use of two diodes in the circuit arrangement. know that the peak output voltage is similar to one-half of the total secondary voltage in the full-wave rectifier. know the differences that exist between the half-wave rectifier and the full-wave rectifier.	Students will: - construct a half-wave rectifier circuit. - construct a full-wave rectifier circuit. - draw circuit diagrams of and explain theory of operation of half-wave rectifier, a full-wave rectifier, and a bridge rectifier. NOTE: Vocational and Academic terachers will coordinate activities.	Students will: - develop an understanding of the algebraic meaning of words. - translate English phrases to algebraic expressions or an algebraic equation. - solve the equation. - check the solution by determining if it satisfies conditions of the original word problem. - use the formula to solve voltage problems: % Voltage Regulation = $\frac{Eni - Ef}{Efi} \times 100$ Eni = Voltage with no load. Efi = voltage with full load.	Given the proper instruction the student should be able to: translate English phrases to mathematical terms. solve word problems. find the percentage of Voltage Regulation by using the formula.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
POWER SUPPLY FILTERS Time Allotment: Days 55-60 Given the proper instruction, the student should be able to: identify the characteristics of various power supply circuits. trace current flow through various supply circuits. trace current flow through various filter circuits. identify types of failure from schematic drawings and troubleshoot problems based on symptoms of failure established by the electronics industry.	Students will: - construct an RC filter circuit. - calculate and solve the equation of a full-wave rectifier circuit with input frequency of 60Hz Rl of 5K and capacitor value of 19.3 micro F, assuming a sawtooth waveshape for the ripple voltage. - construct a voltage double circuit. - construct a choke input of L section filter. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - use the formula for a full-wave rectifier circuit to find the percent of ripple voltage. - percent of ripple = $\frac{\text{Vrms of ripple voltage}}{\text{Vaverage}} \times 100$ vaverage = .637 V peak - find the percent of regulation by using above formula after doubling or constructing a choke. percent of regulation = $\frac{\text{V-load} - \text{V full-load}}{\text{V full-load}} \times 100$	Given the proper instruction the student should be able to: use the formula for a full-wave rectifier circuit to find the percent of ripple voltage. use the formula to find the percent of regulation of ripple voltage after doubling or constructing a choke.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
ZENER VOLTAGE REGULATORS Time Allotment: Days 61-65 Given the proper instruction the student should be able to: explain the characteristics and operation of the Zener Diode. state that the Zener diode operates with desired reverse breakover voltages from about 3 to 250 volts with a minimum impedance. explain voltage and current regulation.	Students will: - construct a basic Zener diode voltage regulator circuit and explain its operation. - construct a shunt voltage regulator circuit and explain its operation. - design and draw circuit diagrams of the above circuits. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - substitute numbers into this formula: $\frac{Rt = R3\ RL}{R3 + RL}$ to get the total. resistance across the power supply. - use this answer in the formula $I=\frac{E}{R}$ to find the current through the divider. (to find the voltage the current would be substituted into another formula E=I x R) NOTE: (Example on p. 173 Gerrish & Dugger)	Given the proper instruction the student should be able to: substitute numbers into a formula. solve the equation for the missing value. use this value in another formula to find the current at a point where it has been divided by load resistance. NOTE: (Current would be substituted into another formula to find the voltage)

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
TRANSISTORS - PART I Time Allotment: Days 66-71 Given the proper instruction the student should be able to: know the construction of NPN and PNP type transistors and to state breakdown characteristics. calculate and measure expected and actual I-V-P gains and outputs. construct and interpret collector characteristics curves for junction transistors.	Students will: - Explain the operation of a transistor. - name three advantages of transistors over the vacuum tube. - construct a transistor amplifier circuit and identify the base emitter collector. - construct an experiment for a junction transistor circuit and explain its operation. - measure and sort good and bad transistors from a mixed group of ten good and 10 faulty transistors. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - use these formulae to find the sum, difference and product of the different currents in a transistor. $I_E = I_B\ I_C$ $I_E = I_B\ \alpha I_E$ $I_B = I_E - I_C$ $I_C = \alpha I_E$ $I_C = I_E - I_B$ $I_B = I_E - I_B$ use this formula to find the voltage gain. $A_V = \frac{\alpha I_E R_{CB}}{I_E R_{EB}}$ NOTE: Example found in transistor electronics by Gerrish/Dugger 199.	Given the proper instruction the student should be able to: substitute into the formulae and find the current gain or current amplification factor. find the voltage gain by substituting into the voltage gain formula.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
TRANSISTORS PART II Time Allotment: Days 72-76 Given the proper instruction, the student should be able to: determine operating points for specified class of operation. determine both alfa and beta characateristics of transistors. evaluate the operation of transistor circuits to determine probable cause of faulty operation. explain that in transistor amplifier circuits the possibilities are common base, common emitter and common collector.	Students will: - construct a series parallel transistors amplifier circuit using NPN transistors. - construct a PNP type amplifier circuit. - draw a circuit diagram of a transistor current regulator circuit and explain its operation. - calculate power dissipation in a transistorized circuit. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - find the collector current I'c for a transistor that has a alpha of .98 and the I_E is 10 m A. - Find the voltage gain for a transistor that has an alpha of .99 and a resistance ratio of 50/100,000 ohms. - find the power gain AP if the current gain Al is 25 and the voltage gain Av is 300. - use the complementary relationship to find B if L = .98.	Given the proper instruction the student should be able to: use the equation for the forward emitter circuit (BETA) $B_{dc}=\frac{IC}{IB}/Vce$ constant use the current amplification factor (ALPHA) $\alpha = \frac{Ic}{Ie}$ use the complementary relationships $\alpha = \frac{B}{BH}$ find the power gain by multiplying the current and voltage gains. $A_p=A_v\ A_l$ and $A_p = \frac{Pout}{PIN}$ consider the resistance ratio and compute the power gain by this formula. $\frac{Pout}{Pin} \quad 2 \quad \frac{RCB}{REB}$

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OBJECTIVES AND ACTIVITIES

Vocational Student Activities	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
AMPLIFICATION Time Allotment: Days 77-80 Given the proper instruction the student should be able to: compare BJT and FEY type amplifiers. connect and analyze gain characteristics of cascaded amplifiers. recognize and troubleshoot special amplifier characteristics such as Darlington pair, emitter follower and complimentary amplifiers.	Students will: - construct a simple common base amplifier circuit. - measure voltage/signal amplifier gain by using the oscilloscope. - construct a push-pull amplifier circuit. - construct a class B push-pull amplifier. - construct a cascaded amplifier circuit. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - describe positions of points in a plane by using ordered pairs (3,5). - make a coordinate axes showing positive and negative numbers. - plot joints on the coordinate axes. - find directed distance on lines parallel to one of the axes. - use the slope formula, $m=\frac{Y_2 - Y_1}{X_2 - X_1}$ to find the slope of nonvertical line segments. - write the equation of a line when two points are given. - graph a line, given its slope and y-intercept.	Given the proper instruction the student should be able to: graph and understand linear equations. find slopes of nonvertical line segments. write an equation of a line, given two points on it. determine slope and y-intercept from an equation of a line. relate a positive going signed to the base of the transistor, which makes it more positive, to the positive side of the coordinate axes. relate a negative going input signal, which makes the base more negative to the negative addition on the coordinate axes negative side.

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OBJECTIVES AND ACTIVIIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
AMPLIFICATION - Cont'd		Students will: - solve linear equations in two variables when given specific replacement sets. - use function notation. Ref. Algebra Structure and Method Dolciani pp. 335-338 and pp.404-411.	Given the proper instruction the student should be able to: state whether an ordered pair is a solution to a given equation. understand what a function is and how to find its values.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
MOSFETS Time Allotment: Days 84-90			
Given the proper instruction the student should be able to: demonstrate and measure the zero bias characteristic of the metal oxide semiconductor field effect transistor (Mosfets). measure the depletion mode characteristics of a metal oxide semi conductor field effect transistor.	Students will: draw a diagram of and explain the characteristics of the MOSFET. construct a circuit using the MOSFET amplifier. measure the gain of a MOSFET amplifier circuit by using the oscilloscope. NOTE: Vocational and Academic teacher will coordinate activities.	Students will: - graph two equations on the same set of axes and name the point of intersection. - solve an equation for one of its variables in terms of the other. - substitute for that variable in the other equation. - solve a system of two equations by addition. - solve problems involving systems of equations.	Given the proper instruction the student should be able to: solve a system of equations by graphing. solve a system of equations by substitution or additon. solve problems involving systems of equations. read the graph (on pg. 218 of Transistor Electronics using the characteristic curves to find current and voltage excursions with signal input.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIGITAL TECHNIQUES INTRODUCTION Time Allotment: Days 91-96 Given the proper instruction the student should be able to: state the advantages and disadvantages of the intergrated circuit. explain how intergrated chips are made and the various types. demonstrate and verify that a decimal number can be encoded and represented by a binary number. explain that binary coded decimal (BCD) is a specific code using binary numbers to represent decimal numbers.	Students will: - explain the correct methods used to handle I/C chips. - interrupt an eight-bit binary code and convert to decimal. - construct a binary clock. - NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - make a plan value chart for binary numerals up to eight positions: 2^7 2^6 2^5 2^4 2^3 128 64 32 16 8 2^2 2^1 2^0 4 2 1 - write the binary numerals for ten numbers less than 200. - change ten binary numerals of 8 digits or less to the decimal system. - arrange a series of lights in a row and indicate numbers by turning certain lights on and leaving others off. - use binary addition to add five digit numbers.	Given the proper instruction the student should be able to: write the binary numerals which represent any number up to 255. change an 8-digit binary numeral to the decimal system. add binary numbers. multiply binary numbers. name the largest number that can be represented by a binary numeral consisting of any number of places from 1 to 8

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIGITAL TECHNIQUES INTRODUCTION - Cont'd		Students will: - use binary multiplication to find the product of two and three digit numbers. - use direct variation to solve problems. (Ref. Algebra Structure and Method, Dolciani pp. 418-423	(Ref. Math A Modern Approach Wilcox and Yarnelle, p. 5-21)

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SEMI CONDUCTOR DEVICES **DIGITAL CIRCUITS** Time Allotment: Days 97-100			
Given the proper instruction the student should be able to: define and demonstrate bipolar junction transistors. explain that a MOSFET can have two gates, known as a dual gate MOSFET. demonstrate the operation of a MOSFET voltage amplifier circuit. determine its voltage gain.	Students will: - construct a bipolar transistor switch. - construct a saturated switch circuit. - construct a MOSFET circuit. - draw circuit diagrams of the above circuits and explain their operations. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - define prime factors and give examples. - factor 10 integers as a product of primes. - use prime factors to find the least common denominator to add and subtract fractions. - use prime factors in multiplying and dividing fractions. - solve five problems involving the fundamental operations on fractions. - solve five formulae which involve fractions.	Given the proper instruction the student should be able to: understand the meaning and use of prime factors. understand and perform complete factorization of a numeral. use prime factors to find least common denominators. use prime factors in finding greatest common factors. solve formulae such as $A_V = \frac{\alpha I_E R_{CB}}{I_E R_{EB}}$ which involve fractions.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
3C DIGITAL LOGIC GATES Time Allotment: Days 101-114 Given the proper instruction the student should be able to: apply the fundamentals used in digital logic circuits and systems. explain the basic logic functions are AND & OR GATES with their inverted functions NAND & NOR. explain combinational logic gates.	Students will: - construct a circuit using an inverter. - construct an AND gate circuit. - construct a NAND gate circuit. - construct a logic circuit with relay switching. - construct a logic gate circuit. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - simplify fractions such as $\frac{A^3b - A^2}{A^4}$ - multiply fractions such as $\frac{2^2 - 3x + 2}{x + 5} \cdot \frac{2x + 10}{x - 2}$ divide fractions such as $\frac{2x^2 - x}{4x^2 - 1} \div \frac{x^2}{4x^2 + 4x + 1}$ - add like fractions $\frac{x}{x^2 - 4} + \frac{2}{x^2 - 4}$ - add fractions with different denonimators such as : $\frac{2b - 3}{6b} + \frac{4b + 1}{2b}$	Given the proper instruction the student should be able to: perform the fundamental operations with rational expressions. simplify rational expressions. simplify complex fractions solve equations with fractions such as for the forward emitter circuit, where (BETA) Bdc = $\frac{IC}{IB}$ / Vce constant.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Objectives	Academic Student Activities	Academic Student Objectives
DIGITAL LOGIC GATES Cont'd		Students will: - subtract fractions such as: $\frac{2x-3}{x^2-7x+12} - \frac{x-1}{x-4}$ - solve equations with fractions such as: $B_{dc} = \frac{\Delta C}{\Delta B}$ Vce constant	

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
3B DIGITAL - INTERGRATED Time Allotment: Days 115-128 Given the proper instruction the student should be able to: familiarize him/herself with intergrated digital logic gates by constructing and demonstrating the operation of various logic circuits using a quadruple two-input positive NAND gate. explain that precautions are to be taken while working on IC's for heat is a destroyer of IC's. explain how the TTL eliminates the need for interfacing circuitry. explain n-p channel enhancement-mode devices and their operation in push-pull complementary digital circuits.	Students will: - construct a logic gate circuit. - construct a flat-back circuit. - demonstrate how heat will destroy an integrated circuit by using an electric soldering iron. - construct a TTL logic gate circuit. - construct a CMOS gate. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - review finding products of powers. - find the quotient of powers such as: $\frac{A^m}{A^n}$ and $\frac{6 \times 3}{3 \times 5}$ - solve problems with zero as the power, such as: $5 \times 4(3^0)$ - write ten large numbers and ten very small numbers, using scientific notation such as: 8, 360, 000, 000, 000 = 8.36×10^{12} 0.0000000417 = 4.17×10^{-8} - change ten rational numbers to repeating decimals after several examples such as: $\frac{2}{3} = 3\overline{)2.00}$ .66 18 20 18 2	Given the proper instruction the student should be able to: find quotients of powers. use zero and negative exponents. understand scientific notation. understand repeating decimals.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
DIGITAL - INTERGRATED Cont'd			
		Students will: - multiply monomials. - find powers of a monomial. - divide monimials. Ref. Algebra Structure and Method Dolciani pp. 148-150, 151-153, 187-190	Given the proper instruction the student should be able to: apply $a^x \cdot A^y = A^{x+y}$ where x and y are integers. apply $(A^x)^y = A^{x \cdot y}$ where x and y are integers. apply $A^x/A^y = A^{x-y}$ are integers, $x = y$ and $A \neq 0$.

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OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BOOLEAN ALGEBRA Time Allotment: Days 129-142			
Given the proper instruction the student should be able to: identify the AND gate device and list the characteristics of the gate. draw the truth table and identify the theory of pulsetrain operation. write a Boolean expression for the AND gate, and draw without error, an AND circuit using switches. define the NAND gate as a universal gate. explain that in Boolean albegra, the plus sign is read as OR in the equation, A + B = C.	Students will: - construct an AND gate circuit. - construct an OR gate circuit. - construct a circuit combining AND and NAND circuits. - solve problems of Boolean equations and digital logic. - interpret decimal conversion using truth tables. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - find the solution set of inequalities such as: $7x + 5 \geq 3x - 19$ - graph the inequality in its simplified form. - graph the intersection and union of two sets such as: $(x/x < 3)$ and $(x/x \geq 3)$ - write in logic mathematical symbol expressions such as a and b, either a or b, the negative of a, (it is false that a is true) and the aggregate symbol that says, "when input signal a or or input signal b or both are applied, there will be no output signal."	Given the proper instruction the student should be able to: find and graph the solution sets of inequalities. graph and describe the union and the intersection of two sets. understand the logic mathematical symbols and, or +, not -. understand and use aggregate symbols ( ). [ ] use truth symbols 1, 0 to make truth tables.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
BOOLEAN ALGEBRA Cont'd		Students will: - use the switch circuit with an AND gate to write a truth table when both switch A and B must be closed. - solve problems on page 531 (Basic Math for Electronics - Cook and Adams p. 531) - use problem solving strategies to solve problems involving inequalities. - graph linear inequalities in two variables. (Ref. Algebra, Structure and Method, Dolciani pp. 459-464, 480-483	Given the proper instruction the student should be able to: solve problems of Boolean equations and digital logic. solve problems which involve inequalities. show the appropriate open or closed half-plane for an inequality in two variables.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
FLIP FLOPS REGISTERS Time Allotment: Days 143-153			
Given the proper instruction the student should be able to: identify and demonstrate the digital logic level-triggered D flop-flop and verify its logic function. define the digital logic R-S flip-flop, verify its logic output states and demonstrate its operation. define and demonstrate a basic parallel storage register its operation and verify its logic function. identify and demonstrate the digital logic J-K flip-flop and verify its logic function in a circuit.	Students will: - construct a D-type flip-flop. - construct a RS flip-flop. - construct a storage register in the laboratory. - construct a circuit with five JK-type flip-flops. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - add or subtract ten polynomials and arrange the terms in decending powers. - find the product of monmials times polynomials. 3 x (5 x+4) - find the product of two polynomials (2x+3) (5x$\pm$6 x + 2). - square a binomial $(2 x - 6)^2$. - multiply two binomials such as: (6 x - 7) (3 x + 5) or (5 x - 3) (5 x + 3) - identify algebraic expressions as monomials, binomials, trinomials, or polynomials.	Given the proper instruction the student should be able to: combine polynomials. find special products of polynomials. find the product of the sum and difference of two numbers. find the square of a binomial. find the product of two binomials. identify polynomials by the number terms. give the degreee of the polynomial.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
FLIP FLOPS REGISTERS Cont'd		Students will: - find the quotient of a polynomial (fewer than five terms) when divided by a monomial. Ref. (Algebra Structure and Method, Dolciani pp. 143-147, 191-195	Given the proper instruction the student should be able to: find a monomial facator of a polynomial.

APLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
SEQUENTIAL LOGIC CIRCUITS **Time Allotment: Days 159-172** Given the proper instruction the student should be able to: identify the basic digital ripple counter and its logic function as an UP counter. define and demonstrate the basic ripple counter and show it can be made to function as a down-counter. define and demonstrate a serial BCD decade counter and show it can be constructed and interfaced to a BCD-to-decimal decoder. identify the basic parallel (synchronous) counter and show how it can function as an up or down counter. explain the one-shot multivibrator and show how it can be wired using discrete components.	Students will: - construct a riple counter using four JK flip-flops. - construct a UP counter. - construct a Down counter. - construct a BCD counter. - construct a parallel load shift register. - construct a clock using a one shot to start it. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - find the common monomial factor of a polynomial such as $2x^2 + 6x$. - find the difference of two squares such as $9x^9 - 16$. - facator a perfect square trinomial such as $A^2 + 2ab + b^2$. - factor trinomials of the form $x2 + bx + c$ or $x2 - bx + c$ or $x2 \pm bx - c$. - factor trinomials of the for $ax2 + bx + c$ or $ax2 - bx + c$ or $ax2 \pm bx - c$. - solve quadratic equations such as $2x2 + 9x - 5 = 0$ and $7x = x2 - 10$.	Given the proper instruction the student should be able to: factor polynomials of different forms. solve quadratic equations by factoring. solve problems from electronics which involve quadratic equations.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
COMBINATION LOGIC CIRCUITS Time Allotment: Days 173-180 Given the proper instruction the student should be able to: explain that the hexadecimal number system as its base the equivalent of the decimal number sixteen. define and demonstrate that a decoder converts binary number to decimal numbers. identify and demonstrate the digital logic OR gate and verify its logic function.	Students will: - construct an octagal to hexa-decimal decoder using laboratory materials/components. - construct a binary to hexadecimal coder. - construct an exclusive OR circuit. NOTE: Vocational and Academic teachers will coordinate activities.	Students will: - define a rational expression as any expression that can be written as the quotient of two polynomials (divisor not 0). - simplify expressions such as $\frac{3x^2}{9x}$ - factor out the greatest common factor in $6x^3 + 3x^2 + 9x$ locate V2 and TT on the number line. - multiply expressions such as $\frac{x^3y^4}{2}, \frac{4}{x^2y}$ - divide problems such as $\frac{x-3 \cdot 2x-6}{5 \cdot 10}$	Given the proper instruction the student should be able to: understand the meaning of rational expressions. simplify rational expressions. find greatest common factors. locate rational numbers on the number line. find products and quotients of rational expressions. find sum and difference of rational expressions.

APPLIED MATHEMATICS: COMMUNICATIONS ELECTRONICS

OBJECTIVES AND ACTIVITIES

Vocational Student Objectives	Vocational Student Activities	Academic Student Activities	Academic Student Objectives
COMBINATION LOGIC CIRCUITS - Cont'd		Students will: - add expressions such as $\frac{7}{A-4} + \frac{3}{A^2-16}$ - find the difference of problems such as $\frac{2x-3}{x^2-7x+12} - \frac{x-1}{x-4}$	

APPENDIX

STUDENT PROFILE

Name of Student _____

Homeroom _____

Vocational Program _____

Vocational Teacher _____

Address of Student _____

_____

Phone _____

Name of parent or guardian _____

Number where parent or guardian can be reached during the day _____

Name of support persons outside school environment and Phone Number (if applicable)

_____

Date entered vocational program _____

Date completed program _____

Days absent --Quarter 1_____Quarter 2_____Quarter 3_____Quarter 4_____

Quarter 5_____Quarter 6_____Quarter 7_____Quarter 8_____

Reading score -- entry to program _____exit _____ test used _____

English score -- entry to program _____exit _____ test used _____

Mathematics score -- entry to program _____ exit _____ test used _____

Marks in Vocational Program	Quarter 1	Quarter 2	Quarter 3	Quarter 4
	Quarter 5	Quarter 6	Quarter 7	Quarter 8

Marks in other courses

Course _____Quarter 1___Quarter 2___Quarter 3___Quarter 4___

Course _____Quarter 1___Quarter 2___Quarter 3___Quarter 4___

Course _____Quarter 1___Quarter 2___Quarter 3___Quarter 4___

Course _____Quarter 1___Quarter 2___Quarter 3___Quarter 4___

Course _____Quarter 1___Quarter 2___Quarter 3___Quarter 4___

Course _____Quarter 1___Quarter 2___Quarter 3___Quarter 4___

Applied Academics - English and Mathematics

Parts I, II, IV, and V of this form are to be completed by the vocational teacher who will then give copies of this form to the reading and mathematics teachers before the unit is taught. The reading teacher completes Part III. Only one form is needed per unit regardless of the number of students involved.

Names of students _____

Vocational Program Unit _____

I. Vocabulary

Technical _____

Non-Technical _____

II. Assigned reading _____ pages _____

III. Reading Skills/ English Skills _____

IV. Types of writing involved in this unit _____

V. Mathematics involved in this unit _____

VI. Special Considerations:

FORM C - 1

A-3

GROUP WORK RATING FORM, VOCATIONAL CLASS

4 - Always 3 - Most of the Time 2 - Sometimes 1 - Never

TASK	Term 1	Term 2	Term 3	Term 4		
finishes study guide (or other work) independently before joining group						
has necessary materials (guide, book, pencil, etc.)						
sticks to the subject						
participates in group discussion by asking the opinions of others						
listens when other group members are talking						
is courteous to other group members - avoids personal attacks						
willingly helps other group members						
uses time wisely						
follows directions carefully						

Total Score: _____ Teacher _____

M. Lynne Smith, Content Reading Manual
Cincinnati City Schools

TEACHER'S EVALUATION OF STUDENT - AFFECTIVE DOMAIN

Name of Student _____

Name of evaluating teacher _____

Date _____Term _____

Applied Academics teachers are to evaluate stuents in the following categories at the end of each term. The rating is to be written in the blank space in the "Rating" column.

	Excellent 5 4 3 2 Poor 1	Rating
1.	Follows directions	_____
2.	Takes responsibility	_____
3.	Cooperates with peers	_____
4.	Responds positively to criticism	_____
5.	Cooperates with superiors	_____
6.	Takes the initiative	_____
7.	Manages time well	_____
8.	Persists until task is accomplished	_____
9.	Is open to new ideas	_____
10.	Is organized	_____

Note: During the term, conference teachers will discuss their ratings and come to a consensus on each one. The score recorded on the Applied Academics Evaluation Form is an average rating, that is, the consensus ratings are added and the total is divided by ten. (number of item)

ESTES ATTITUDE SCALE

Date _____ Name _____

Directions: Respond to each item below in terms of A (strongly agree), B (agree), C (undecided), D (disagree), or E (strongly disagree). The scale is repeated here.

Circle the letter indicating your feeling.

A - Strongly Agree B -Agree
C - Undecided D -Disagree
E - Strongly Disagree

A B C D E 1. Reading is for learning but not for enjoyment.

A B C D E 2. Money spent on books is well spent.

A B C D E 3. There is nothing to be gained from reading books.

A B C D E 4. Books are a bore.

A B C D E 5. Reading is a good way to spend spare time.

A B C D E 6. Sharing books in class is a waste of time.

A B C D E 7. Reading turns me on.

A B C D E 8. Reading is only for grade grabbers.

A B C D E 9. Books aren't usually good enough to finish.

A B C D E 10. Reading is rewarding to me.

A B C D E 11. Reading becomes boring after about an hour.

A B C D E 12. Most books are too long and dull.

A B C D E 13. Free reading doesn't teach anything.

A B C D E 14. There should be more time for free reading during the school day.

A B C D E 15. There are many books which I hope to read.

A B C D E 16. Books should not be read except for class requirements.

A B C D E 17. Reading is something I can do without.

A B C D E 18. A certain amount of summer vacation should be set aside for reading.

A B C D E 19. Books make good presents.

A B C D E 20. Reading is dull.

SCORING DATE_____

Positive items: Nos. 2, 5, 7, 10, 14, 15, 18, 19
Negative items: Nos. 1, 3, 4, 6, 8, 9, 11, 12, 13, 16, 17, 20

Check the response values for the answers. Record them on the answer sheet.
If "C" was marked for #1, the score would be 3; "A" for #2 would be a score of 5, etc.
Then total the score.

		A	B	C	D	E
A B C D E	1.	1	2	3	4	5
A B C D E	2.	5	4	3	2	1
A B C D E	3.	1	2	3	4	5
A B C D E	4.	1	2	3	4	5
A B C D E	5.	5	4	3	2	1
A B C D E	6.	1	2	3	4	5
A B C D E	7.	5	4	3	2	1
A B C D E	8.	1	2	3	4	5
A B C D E	9.	1	2	3	4	5
A B C D E	10.	5	4	3	2	1
A B C D E	11.	1	2	3	4	5
A B C D E	12.	1	2	3	4	5
A B C D E	13.	1	2	3	4	5
A B C D E	14.	5	4	3	2	1
A B C D E	15.	5	4	3	2	1
A B C D E	16.	1	2	3	4	5
A B C D E	17.	1	2	3	4	5
A B C D E	18.	5	4	3	2	1
A B C D E	19.	5	4	3	2	1
A B C D E	20.	1	2	3	4	5

SANDERS ATTITUDE SCALE

A means "I strongly agree"
B means "I agree"
C means "I'm undecided"
D means "I disagree"
E means "I strongly disagree"

		A	B	C	D	E
1.	Teachers expect their students to fail.					
2.	Teachers respect their students' opinions.					
3.	Teachers don't understand what their students need					
4.	Teachers are good listeners.					
5.	Grades show how much a student has really learned.					
6.	Students' answers are usually wrong.					
7.	Teachers encourage students to share ideas with each other					
8.	Students must accept their teachers' opinions					
9.	Teachers help their students to succeed.					
10.	Class discussions are a waste of time.					
11.	It is okay to be wrong.					
12.	Most tests are unfair.					
13.	Teachers want to know what their students believe					
14.	It is difficult to succeed in school.					
15.	Teachers encourage students to think for themselves.					

SANDERS ATTITUDE SCALE

Scoring

	A	B	C	D	E
1.	1	2	3	4	5
2.	5	4	3	2	1
3.	1	2	3	4	5
4.	5	4	3	2	1
5.	5	4	3	2	1
6.	1	2	3	4	5
7.	5	4	3	2	1
8.	1	2	3	4	5
9.	5	4	3	2	1
10.	1	2	3	4	5
11.	5	4	3	2	1
12.	1	2	3	4	5
13.	5	4	3	2	1
14.	1	2	3	4	5
15.	5	4	3	2	1

Total Score: _____

Mean Score: _____

The Sanders Attitude Scale is reprinted by permission of the author, Peter L.Sanders.

APPLIED ACADEMICS

EVALUATION FORM

1. Student's Name _____

2. Vocational Program _____ School _____

3. Standardized reading scores

   Stanford Test of Academic Skills - Level 1

   Composite score -- Pre _____ date _____

   Post _____ date _____

   Change _____ date _____

4. Standardized English scores

   Stanford Test of Academic Skills - Level 1

   Composite score -- Pre _____ date _____

   Post _____ date _____

   Change _____ date _____

5. Standardized Mathematics scores

   Stanford Test of Academic Skills - Level 1

   Composite score -- Pre _____ date _____

   Post _____ date _____

   Change _____ date _____

6. Writing Sample - Mean T-unit length

7. Term grades in vocational program

Last Year		Present Year	
Term 1	_____	Term 1	_____
Term 2	_____	Term 2	_____
Term 3	_____	Term 3	_____
Term 4	_____	Term 4	_____

8. Term grades in language or math units

Last Year		Present Year	
Term 1	_____	Term 1	_____
Term 2	_____	Term 2	_____
Term 3	_____	Term 3	_____
Term 4	_____	Term 4	_____

9. Days absent per term

Last Year	Present Year
Term 1 _____	Term 1 _____
Term 2 _____	Term 2 _____
Term 3 _____	Term 3 _____
Term 4 _____	Term 4 _____

10. Sanders Attitude Scale

Mean score - Pre _____ date _____

Mean score - Post _____date _____

Change _____

11. Estes Attitude Scale (reading)

Mean score - Pre _____ date _____

Mean score - Post _____date _____

Change _____

12. Group Work Rating Form

Scores - Term 1 _____ Term 2 _____Term 3 _____ Term 4 _____

13. Average Rating Form

Evaluation of Student - Affective Domain
(consensus from Vocational and Applied Academics teachers)

Term 1 _____ Term 2 _____ Term 3 _____ Term 4 _____

TASK Retrieval Sheet - Applied Academics Program

Vocational Program _____ Academic Subject _____

Vocational Instructor _____ School _____

Class Period Scheduled _____ Academics Teacher _____

Sub Tests Needed
Communications
English, Vocab. Rdg.
Math
Math & Reading

NAME	GRADE	STUDENT NUMBER	Sub-Test: Pre-Test Raw	%	NCE	G.E	Post-Test Raw	%	NCE	G.E.	Change Raw	%	NCE	G.E.	Sub-test: Pre-Test Raw	%	NCE	G.E.	Post-Test Raw	%	NCE	G.E.	Change Raw	%	NCE	G.E.
1.																										
2.																										
3.																										
4.																										
5.																										
6.																										
7.																										
8.																										
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20.																										